Annual Review

ABROAD...

Navy Seabees in Many Combat Zones

Building bases and aiding landings with bulldozers, pontoons and guns, they won praise from every quarter for their achievements.

★

Marine Corps Engineers in the Pacific

Differing only in name from other fighting Marines, these new units made history in both combat and construction.

★

Army Engineers in All War Theaters

From Burma to Bizerte by way of the British Isles, they chalked up unsurpassed accomplishments in both building and fighting.

AT HOME...

New York City's Postwar Public Works

★

Engineering Education in Wartime

★

Stage Set for Postwar Housing Boom

★

Construction Equipment Goes to War

★

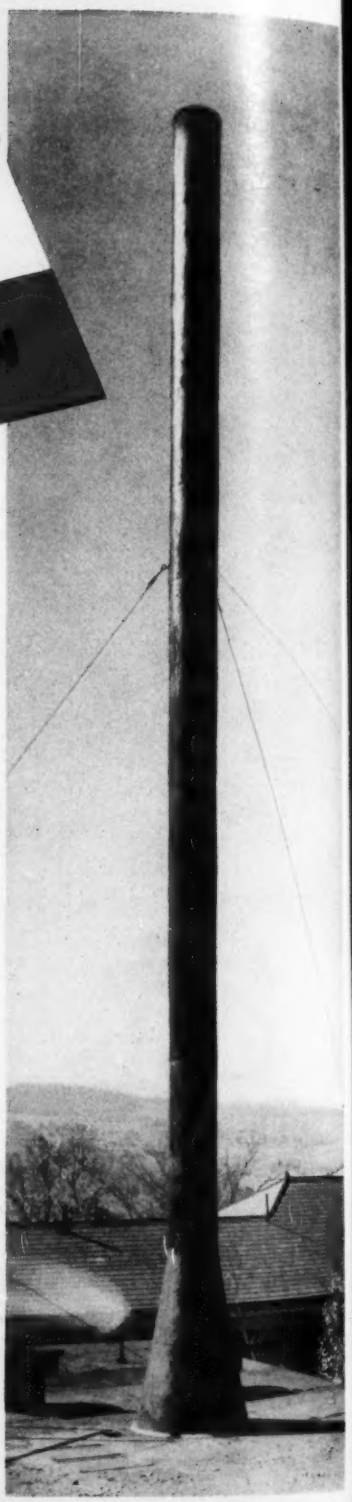
Statistical Review of the Year

...nd Forecast

The Old Stack Died Too Soon . . .

so the new one is

BYERS WROUGHT IRON



When the power plant stack (made of ordinary material) at the Windber, Pa., Hospital failed after only 11 years of service, the engineer reviewed the possibility of getting greater durability before he wrote his specifications. The result is shown: the new stack is Byers Wrought Iron.

Any sound solution of a stack problem must start with the corrosive conditions involved. Carbon dioxide is produced whenever fuel is burned. If this gas is absorbed by moisture, it makes a highly destructive acid. If sulfur is present in the fuel, it too will form a corrosive acid. The condition may be aggravated at any time by increase of moisture in the flue gases, or by the cooling of the gases—through the use of economizers, or through intermittent operation which allows stack temperatures to drop below the dew point.

No ferrous metal is immune to this acid attack . . . but wrought iron is highly effective in resisting it. The matrix of high-purity iron is threaded with tiny fibers of glass-like silica slag. These fibers diffuse and disperse the corrosive attack, and so combat the pitting and rapid penetration that generally causes ordinary materials to fail. Further, the initial protective film is firmly anchored, and helps to shield the underlying metal from destruction.

You will find evidences of wrought iron's greater durability all over the country, in stacks that are still serving long after those made of low-first-cost materials have failed. Some of the most dramatic examples are provided by composite stacks. Take the one on a water company's plant, for instance. The top ring of the wrought iron stack required replacement after 30 years of uninterrupted service. An ordinary material was used in the replacement, *which failed after only 5 years.* The second replacement was naturally wrought iron, and it—and the original wrought iron in the lower part of the stack—are still on the job.

If you have a stack replacement problem, why not investigate and see whether wrought iron would make that new stack last longer. Our technical bulletin, "Wrought Iron in Flue Gas Conductors and Coal Handling Equipment" will give you some helpful information . . . and you can always call on our Engineering Service Department for specific service information.

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ELECTRIC FURNACE ALLOY STEELS · OPEN HEARTH ALLOY STEELS
CARBON STEEL TUBULAR PRODUCTS

J-9259

CONSTRUCTION TRENDS

Notes on significant movements in the construction industry

Character of 1943 Construction Activity

CONSTRUCTION ENGINEERS and contractors, mopping-up after the greatest war emergency building program in history, put $3,061,844,000 worth of new work under construction in 1943. This volume does not include known but unreportable secret work. Without being able to take credit at this time for the full measure of the year's volume, recorded construction is 62 percent below the 1942 reported total, $8,000,000,000 (corrected for contract cancellations ordered by WPB).

Federally-financed work continued as the major source of new construction in 1943 and originated 77.4 percent of the total. This federal share is topped by the 88.4 percent in the war year 1942. In 1941 the federal portion was 61.5 percent of the *ENR*-reported total; in 1939, the last strictly pre-war year, it was 11.8 percent; in 1934, the depression year, 25.8 percent; and in 1929, the skyscraper building period, 2.6 percent.

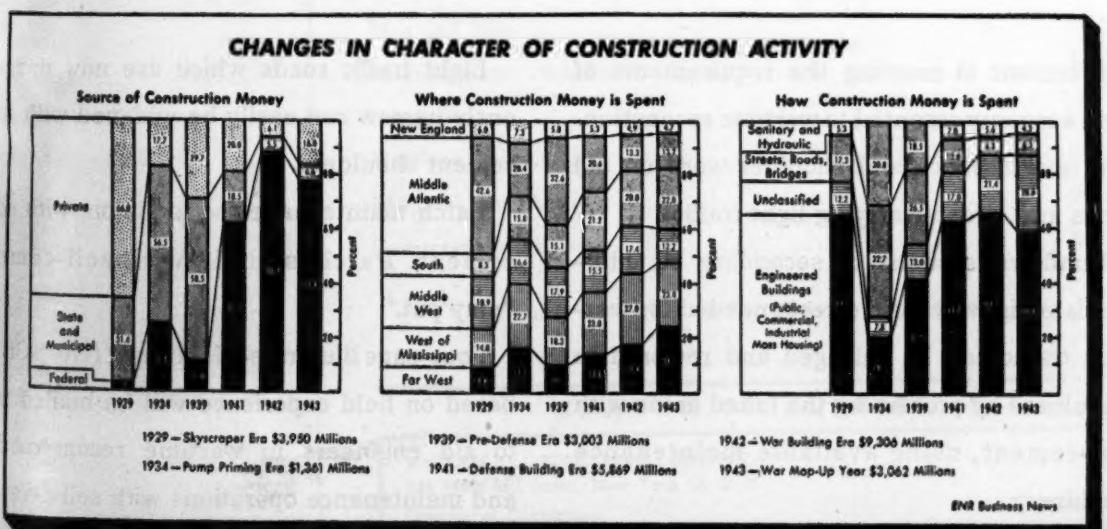
Private construction's share of the 1943 volume increased to 16.0 percent from the 6.1 percent in 1942. Actual dollar volume for 1943, $491,298,000, however, was 10 percent lower than in the preceding year. The private portion, though higher than in 1942, declined from the 20.0 percent share in 1941 and is in sharp contrast with the 66.0 percent reported in 1929.

The state and municipal construction share was 6.6 percent of the U. S. total, up from 5.5 percent portion reported in 1942, though, as in private, actual dollar volume declined. The 1943 share was well below 1934 and 1939, when state and municipal made up 56.5 and 58.5 percent of the respective totals for these years.

Engineered building construction was responsible for 59.4 percent of the 1943 volume, a portion that compares with 66.7 percent in 1942. Public buildings, made up almost entirely of federally-financed war structures, accounted for 46.4 percent; private industrial buildings were 5.5 percent; and commercial building and large-scale private housing was 7.5 percent.

Unclassified construction increased its share of the total from 21.4 percent in 1942 to 28.0 percent in 1943. Sanitary and hydraulic project volume, however, declined from 5.6 percent of the total in 1942 to 4.3 percent in 1943. Road and bridge construction's share, 8.3 percent in 1943, compares with 6.3 percent last year.

Over 24 percent of the year's construction was in the Far West states, a portion that compares with 17.4 percent in 1942. West of the Mississippi states were responsible for 23.8 percent compared with 26.5 percent last year when they led the nation.



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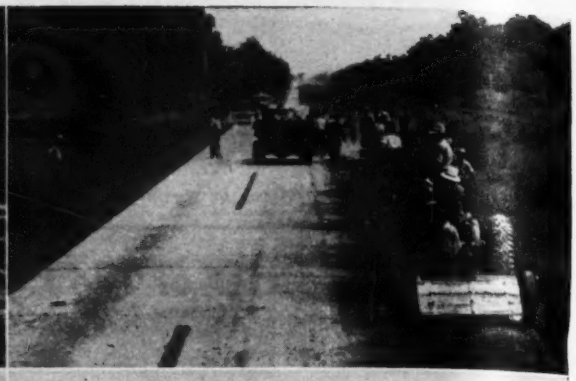

SOIL-CEMENT economical for Wartime Maintenance

★ ★ ★

Spreading cement for salvaging old gravel street in Wisconsin.

Putting finishing touches to newly compacted soil-cement patch which soon will carry traffic.

Mixing soil and cement on shoulder project in South Carolina.

Right half of old gravel road in Nebraska salvaged by soil-cement process.

Soil-cement is meeting the requirements of rigid economy essential to wartime reconstruction, maintenance and shoulder work on old roads and streets carrying light traffic.

Rundown sections of secondary or intermediate highways and streets needed for wartime traffic can be salvaged and restored to usefulness by processing the failed areas with soil-cement, using available maintenance machinery.

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Patch maintenance too is simple with soil-cement. Patches made with soil-cement "stay put."

Four-page illustrated data sheet (No. SCB-6) based on field experience will be mailed free to aid engineers in wartime reconstruction and maintenance operations with soil-cement.

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WALDO G. BOWMAN, *Editor* ALBERT E. PAXTON, *Manager*

Vol. 132 FEBRUARY 24, 1944 No. 8

COMING NEXT

• Civil engineers in general, and land surveyors in particular, will be interested in a new method for adjusting precise traverses on plane grid systems. Greater accuracy is made possible over that obtainable by use of the normal procedure. The author describes the method in detail and illustrates his description with a step-by-step solution of a typical problem. See *ENR*, Mar. 9 issue.

• America's ability to produce and the "know how" of our engineers and contractors was thoroughly demonstrated during recent construction of an airplane modification center providing 622,720 sq.ft. of floor area. Design and working drawings were turned out in 21 days, and the structure was delivered complete within another 92 days. The project will be described in Mar. 9 issue.

• The group of engineers from the Ford Company who camped on the banks of the Rio Tapajog one hot and humid night in December 1928 faced a great challenge. On the next day they were to begin the task of planning and building the physical facilities around which a rubber plantation might exist and expand in the Amazon basin of Brazil. How well these pioneers succeeded in their mission will be told in *ENR*, Mar. 9 issue, by Edward J. Cleary, who visited the plantation.

LOOKING AHEAD

• Lead-base paints for structural purposes are to be the subject of a second article of a series on paints for use in the construction field. The first article, "How Zinc Saves Steel from Rusting," was published in *ENR*, Nov. 4, 1943, p. 682. Characteristics of lead-base paints and methods for preparing structural steel for painting will be outlined in an early issue by a recognized authority on the subject.

• A small tunnel, 8-ft. inside diameter, recently completed under an East Coast tidal river provides an interesting design example and illustrates the advantage of setting up a flexible construction plan to meet subsurface conditions developing during progress of the work. The tunnel was built under compressed air without the use of a shield. Shafts were sunk almost entirely as open caissons. The project will be described in an early issue.

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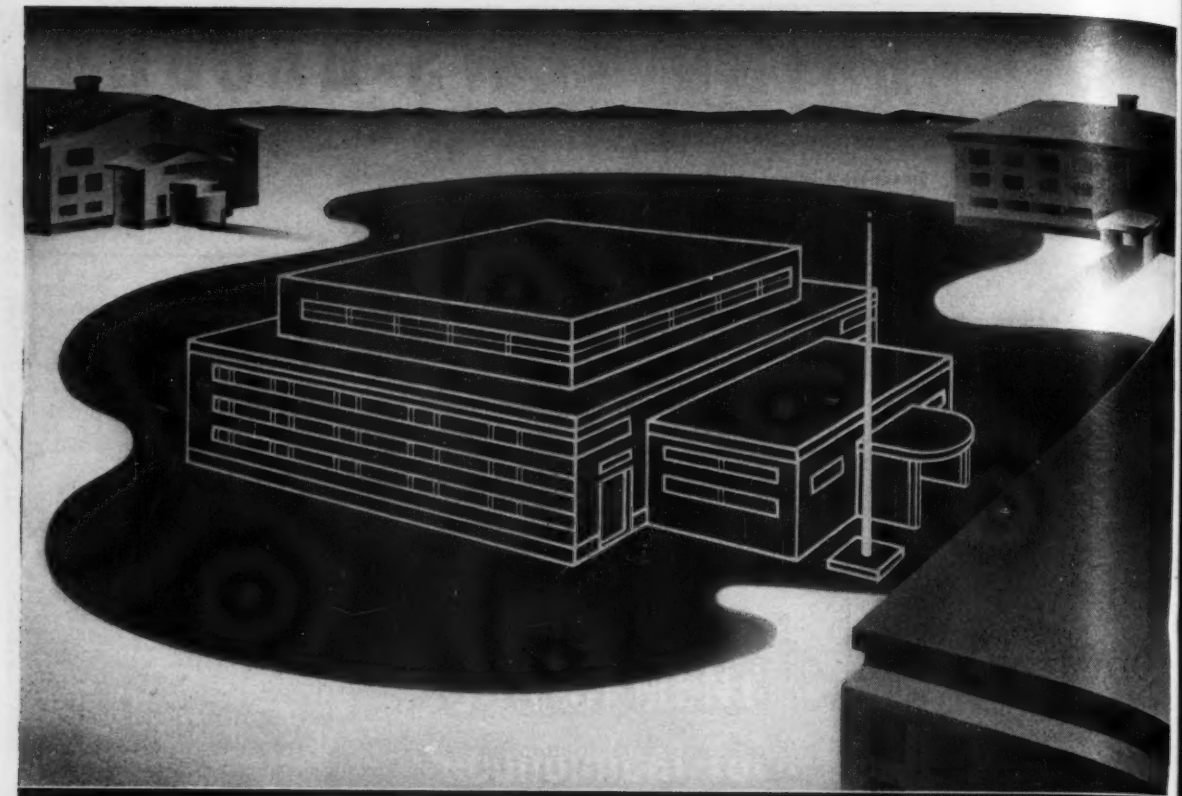

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When new hospital facilities are needed today—they're needed fast. And winter weather is no excuse for delays. One way to speed completion is to use Atlas High-Early cement.

IT'S good building strategy to use Atlas High-Early to overcome winter delays. With it you get serviceable concrete often in one-third the usual time or less.

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The Week In Engineering and Construction

ENGINEERING NEWS-RECORD • FEBRUARY 24, 1944 • VOLUME 132 • NUMBER 8

Scarcity of lumber poses difficult problem for 1944

War crating will take half of total production while total requirements exceed estimated production by as much as 4 billion bd. ft.

Severe competition for lumber between such direct war needs as those for food and ammunition boxes, and tank crates, and such indirect needs as those for construction of housing, is imminent in 1944, according to Col. Fred G. Sherrill, chief of the Central Procuring Agency for Lumber in the Office of Chief of Engineers. He says also that it is not known how both needs can be met.

The great scarcity is—as has been true for many months—in boards of small dimension, and it is possible, Col. Sherrill told an *Engineering News-Record* writer, that the demand for these sizes may be greater than the lumber industry's capacity to produce them.

At the present time, unplaced orders to meet military requirements of the Army, Navy, Maritime Commission, and Lend Lease total over 600 million bd. ft., of which 95 percent is for boards of one and two-inch dimensions. Col. Sherrill said that 1944 war requirements will take 70 percent of total production. As 95 percent of these war needs are for one and two-inch material, there is a serious question of the lumber industry's capacity to produce the needed small sizes.

This situation has developed in spite of the fact that since the height of the war construction program in the summer of 1942 when construction for the Army by the Corps of Engineers, alone, took over one billion bd. ft. of lumber a month, this use has diminished to less than 50 million feet a month, as of December, 1943.

At certain plants, a larger total of one and two-inch materials was used last year for boxing and crating manufactured products than had been used in constructing these same plants in 1942—and some of the plants had required 25 to 30 million feet of lumber for construction. Even in Douglas fir, which ordinarily is used in thick sizes, 85 percent of the present demand is for material smaller than three inches.

Little available abroad

Military successes abroad, Col. Sherrill says, have not been in regions where timber is available in appreciable quantities, and so this country continues to have to produce for overseas use as well as for home consumption. Russia, however, he says, is producing not only all the lumber she needs for her own use, but also has made a substantial quantity available to the United States and Great Britain.

In the Mediterranean theatre, there is no timber accessible to U. S. forces and there has not been any since we in-

Kentucky Dam to be completed this year by TVA

Work on Kentucky Dam near the mouth of the Tennessee River is being pushed with the object of closing it this coming spring to store water for power development. It also will serve to control floods in the lower Mississippi River. The dam is being built by the Tennessee Valley Authority for power, for flood control and to improve navigation in the Tennessee. It has a total length of 8,650 ft., partly of concrete and partly earthfill, and a height above bed rock of 160 ft. The reservoir will store 4,570,000 acre-ft., and the spillway will discharge 1,100,000 cfs.

Two of the three 32,000-kw. generators now being installed will be ready for use by the time the reservoir is filled. Space is provided in the power plant for installation of a fourth and fifth generator.

The completed navigation lock has a lift ranging from 55 to 73 ft. between the Ohio River pool level below the dam to the pool above the dam, which extends upstream 184 miles to Pickwick Landing Dam.

vaded North Africa in November, 1942. Throughout the entire North African campaign lumber was a scarce item very much in demand. With the occupation of Sicily and parts of Italy, there was some relief.

In the southwest Pacific, there is a continuing program on the part of Australia and the United States to develop larger lumber supplies. Despite the output of sawmills in that part of the world, production there is far from sufficient to meet demands. So we are shipping lumber from the Pacific Coast.

Despite the general scarcity of small dimension lumber, Col. Sherrill reports that there are plenty of piles and heavy timbers, the materials most needed for dock construction.

The lack of docks near the war front, added to the lack of automotive transportation between existing port facilities and the scenes of fighting, has required the beaching of vessels as near as possible to depots or supply dumps. Plans are ready, however, and materials available, to build port facilities as the opportunity presents through successes in the various theaters of war.

Inventories must be built up

J. Philip Boyd, director of the War Production Board's Lumber and Lumber Products Division, recently said that 2,000 carloads (50 million bd-ft.) were required to rebuild the dock area of Naples alone. Concerning lumber use in general, Mr. Boyd said that since inventories have dropped from seventeen to six billion bd. ft., this country will have to begin to build up its inventories instead of continuing to rely on them.

Interviews with other government officials revealed that more than 33,200,000,000 bd. ft. of lumber will be needed for war uses in 1944. While this is 4,500,000,000 feet less than was used in 1943, it nevertheless exceeds estimated production by approximately four billion feet. Of the estimated requirements, 3,500,000,000 ft. are for military uses on direct government procurement. Of this amount two billion will be needed for construction for the Army, Navy, Maritime Commission and Air Forces. It has been estimated that 300 bd. ft. of lumber is required *initially* for every man sent overseas.

Other needs include: 1,700,000,000 bd. ft. for railroads, utilities, mining and heavy industries; 7,000,000,000 for new construction, only, for farms, defense housing and other civilian requirements, with 2,000,000,000 bd. ft. for maintenance and repair for this group; and 15,500,000,000 bd. ft. tagged for shipping, mainly for crating and packaging of materials to be sent to the war fronts. Some of this crating lumber may be obtained by sawing structural timbers.

Canadian engineers consider postwar problems of the nation

Engineering Institute of Canada gives a large part of its annual meeting to discussions of postwar readjustment. Great Shipshaw power development described in detail for the first time.

Broad questions relating to the readjustment of the Canadian national economy to a peacetime basis after the war were the main topics of discussion at the 58th annual meeting of the Engineering Institute of Canada held in the city of Quebec Feb. 10-11. Also considered was the great Shipshaw power development on the Saguenay River, details of which were kept from the public because of war conditions until after the work was substantially complete. An international character was given to the meeting by the presence of the presidents and secretaries of some of the American engineering societies and by the award of honorary membership in the Institute to two American engineers, Daniel W. Mead, past president of the American Society of Civil Engineers, and R. E. Doherty, president of the Carnegie Institute of Technology.

The ancient capital city lent its own special atmosphere to the gathering by the attendance of dignitaries of the church and of the provincial government at the annual banquet, and by a special convocation held in the historic halls of Laval University, at which Cardinal Villeneauve of Quebec conferred honorary degrees on K. M. Cameron, retiring president of the institute, and Brig. Gen. Therieault, superintendent of the Quebec Arsenal.

Disposal of surplus equipment

Problems of the postwar period were first brought to the attention of the meeting in a paper presented at the opening luncheon by J. B. Carswell, president of Canada's newly formed War Assets Corporation, a crown company financed by the Canadian government but operated under its own board of directors. Mr. Carswell, a former construction man and industrial executive, and a member of the institute, explained that the purpose of the corporation is to minimize the effect of war surpluses upon the normal economic activity in Canada. The corporation plans to dispose of surpluses back to the respective trades after negotiation so that markets will not be disorganized. The corporation is charged with the disposal of current surpluses, and after the war, with the disposal of war materials, camps and barracks, munitions plants and the tools therein, redistribution of raw materials not then needed, and finally with assisting in integration of British, American and Canadian disposal programs. One of the most difficult problems, Mr. Carswell said, would be the proper disposal of munitions plants and the finding of alternative uses for them. This job already has been started.

Postwar planning

The full-day technical session on postwar planning was inaugurated by the presentation of a joint paper, in three parts, by a group of prominent Montreal engineers who had been meeting for some time previous to the Quebec gathering, preparing data on postwar planning. The authors were J. E. Armstrong, chief engineer of the Canadian Pacific Ry.; R. M. Brophy, general manager, Canadian Marconi Co.; G. A. Gaherty, president, Montreal Engineering Co.; R. L. Weldon, president, Bathurst Power & Paper Co.; H. G. Welsford, general manager, Dominion Engineering Co., and Arthur Surveyer, consulting engineer, Montreal.

Their paper divided the subject into three parts: What is the problem? What can industry do to promote full employment? And what can government do to assist industry? Basing their estimates upon recent official statistics, and assuming that the European phase of the war will be over in 1944, and the Far Eastern phases in 1945, the authors calculated that "industry and services" must be ready to absorb an increase of 21 percent in the number of employees by January 1947 as compared with employment in August 1939. This represents an increase of 34 percent from the number employed in ordinary industry in January, 1943.

The authors suggested that the principal national organizations representing all classes of business should cooperate in setting up a bureau of economic research to study and make available reports and data essential to proper long range planning. Long range planning in regard to capital expenditures was strongly stressed, as was increased production and lower prices.

The third part of the paper presented a detailed study of some aspects of the Canadian tax structure. Specific suggestions were advanced toward remedying defects in the present system, espe-

(*Continued on page* 87)

Baruch report favors public works planning

The "greatest usefulness" of public works, says the report of Bernard M. Baruch and his assistant, John M. Hancock, to James F. Byrnes, director of Office of War Mobilization, "lies in helping to fill the valleys of depression. If public works are to be a reserve of employment," the report continues, "they should not be carried on in a period of full employment."

"Even though we see no likelihood that the materials or manpower for a nation-wide program of public works can be available during the war or even after the defeat of Japan," the report advocates that a "shelf of projects should be put together now," complete as to "planning, designing and engineering—worthwhile projects—not simply make-work schemes," for use when needed.

When the war ends, however, the report continues, "there still will be a great backlog of deferred housing and industrial construction, repair and maintenance that must be satisfied first."

As to funds for advance planning, the report suggests that "Congress may want to establish a fund in the Federal Works Agency with which to assist local bodies in the preparatory planning." Such a fund, says the report, "should be administered with full recognition of the fact that the debt burden of many communities, cities and states is far lower than that of the government."

The report suggests that schools, hospitals, waterworks and other projects, for which plans are complete and funds set aside, but which were deferred because of the war, together with "the backlog of normal construction and housing that has been deferred, *can be made immediately available in any localized areas of unemployment that may develop in the transition period.*" The italics are those of the report.

• • •

Vast road building plan considered for India

According to information from New Delhi, extensive plans are in the making for a postwar program of roadbuilding in India, involving an investment of well over a billion dollars. It is said that the viceroy, Viscount Wavell, is in favor of making this project India's first priority task, and that the chief engineers of the many states are working jointly todward that end.

In India there are approximately 64,000 miles of roads of all kinds, but there are only two routes which could be called national highways; one runs from Peshawar to Calcutt, the other between Bombay and New Delhi.

The new plans call for a through automobile highway from the coast of the Arabian Sea in the west to the Bay of Bengal in the east, and another routed north to Khyber Pass and the border of Afghanistan. There would also be a road starting at Calcutta and carried through Assam, perhaps connecting with the Ledo road which American engineers are now actually building across northern Burma.

It is the objective of the planners to supplement these main highways with enough local roads so that, in time, all of India's 750,000 villages will be brought within five miles of a road suitable for use at all times and in all weathers.

Details of the financing of this great roadbuilding program are not announced, but by some authorities it is considered probable that the British government and the native princes cooperating can carry out the program.

• • •

Cox to head road group in North Atlantic states

Wm. J. Cox, commissioner, Connecticut State Highway Department, was elected president of the Association of

William J. Cox

Highway Officials of the North Atlantic States at the association's annual meeting in New York, Feb. 17-18. He succeeds Herman A. MacDonald of Massachusetts who has served as president for nearly two years.

Mr. Cox has been highway commissioner of Connecticut since 1938. Previous to that he taught at Yale for 11 years and was also traffic engineer for the National Bureau of Casualty & Surety Underwriters.

Due to lack of space in this issue, a report of the meeting of the association will be published in the issue of Mar. 2.

Concrete Institute has full program next week

The 40th annual convention of the American Concrete Institute, to be held at the Palmer House, Chicago, Feb. 29-March 2, has been planned to emphasize and review the new knowledge of concrete that the war construction program developed. Both committee sessions and general meetings will concentrate on this theme.

Perhaps the most important committee meeting will be that devoted to building code changes, of which a great many have been proposed. On the general program, three papers deal with the problems of storing gasoline in concrete tanks, while one is concerned with the new knowledge of termie concrete resulting from the Navy's graving dock construction program. War experience has also stimulated thinking in the highway field, and this subject will be covered by a report of the committee on specifications for concrete pavements and bases, and also by a symposium session relating to concretes containing air entraining agents. At the luncheon on Wednesday, Henry J. Kaiser will address the convention on the subject of "The Concrete Engineer and the Postwar World."

On Feb. 21 the Senate confirmed the promotion of Rear Admiral Ben Moreell to the rank of Vice Admiral.

• • •

New Salt Lake aqueduct contract is awarded

The contract for construction of another link in the Salt Lake City aqueduct system has been awarded to Carl B. Warren of Spokane, Wash., contractor on 9.1 miles of the aqueduct pipe line now being built, it is announced by E. O. Larson, regional director of the United States Bureau of Reclamation.

The additional link will bring water from the Deer Creek reservoir to Salt Lake City by June, 1945.

The contract, awarded on a fixed fee basis, comes under two schedules. The first calls for construction of about 2.5 miles, and the second for an additional 7.9 miles of pipe line, optional at the call of the government, provided necessary supplies are available. Expenditures, including both schedules and materials to be furnished by the government, will amount to about $1,200,000.

Meanwhile, Reclamation Commissioner Harry Bashore has announced that bids will be opened March 15 for construction of siphons, flume, and structures on the Provo reservoir canal.

Flood control speeded in four states

Contract for construction of the first two units of the emergency flood control project along the Rio Grande in New Mexico has been awarded to Henry Thygeson, Albuquerque contractor, by the Army Engineers. Work has begun.

Thygeson's bid of $128,839.40 was the lowest of seven submitted for the first two units of a proposed $363,000 restoration project of the Engineers. Initial work consists of restoring levees, piling and other flood control structures in the Albuquerque area. Similar restoration is to be done throughout the length of the Middle Rio Grande Conservancy District. A total of $200,000 has been allocated to the work, and the Engineers expect another $163,000.

It is planned to have the work completed by May, when danger from spring floods may be expected.

To reclaim thousands of the richest acres in Tulare Lake basin in San Juaquin Valley, Calif., the U. S. Army Engineers are working at top speed restoring levees before the spring floods. During the record floods of 1937–38, approximately 150,000 acres of farm land were inundated by the Kings River and damage was estimated at $20,000,000. Due to the constant threat of floods, farming in the area has always been a gamble.

The Sacramento district office has undertaken construction of diversion structures to curb threatening waters of the lower Kings River at an estimated cost of $215,000. The structures will properly divide the flows between Kings River North and Kings River South

This work is part of a comprehensive plan recommended by the Sacramento district.

Indicative of the size of water conservation and flood control programs that many Pacific Coast communities are planning for the early postwar period are those of citrus-growing Santa Barbara County, Calif., where plans calling for the expenditure of approximately $32,000,000 have reached an advanced stage of discussion.

The project being considered calls for a new and larger dam above the Gilbraltar Dam and lake, source of the city's present water supply. It also provides for another dam on the Santa Ynez River to supply water for other areas, and a third dam for flood control purposes.

Cost of the project, an estimate of which was prepared by engineers of the Bureau of Reclamation, would be borne by the county and federal governments.

The Western North Carolina Flood Control Committee on Jan. 11 requested the Tennessee Valley Authority to include in its new budget requests to Congress an appropriation for preliminary work on a proposed flood control project on the upper French Broad River and its tributaries. TVA has approved engineering studies to cost $100,000 for a flood control program on the upper French Broad River in western North Carolina. It intends to proceed with the studies if Congress approves the use of an unexpended budget balance for the purpose.

The proposed project, designed to protect the French Broad River valley from floods, has been under consideration since 1940, and TVA engineers, who discussed the proposal with representative groups at Asheville, N. C., last fall, have estimated that it would cost $8,210,000. The project has been endorsed by a number of state agencies in North Carolina, as well as by agricultural and industrial groups.

The project would affect the counties of Transylvania, Henderson, Buncombe, Haywood and Madison in western North Carolina, and would include seven storage reservoirs and levees along the French Broad, Hominy Creek and Pigeon River.

The first step toward actual construction of the $50,000,000 Umatilla Dam on the Columbia River near Umatilla, Ore., was taken with the recent award by the Portland district, U. S. Engineers, of a core drilling contract to the Diamond Drill Contracting Co. of Spokane, Wash.

The drilling, which will start immediately, will reveal the general rock structure in the area. Col. Ralph A. Tudor, district engineer, said intensive drilling to determine the powerhouse site will follow.

Exploratory drilling was done five years ago, but this is the first such contract awarded under the revised study of the Columbia River—a long-range plan for power, navigation, reclamation and flood control. Umatilla Dam will be the first important project included in this plan, designed to coordinate future Columbia River improvements with the postwar construction program.

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Arkansas to start reconstruction work

The Arkansas State Highway Department Jan. 31 received full priorities from the War Production Board on its slate of reconstruction of flood-damaged projects. Highway Director W. W. Mitchell said the commission probably would start advertising for bids this month.

The projects, in counties affected by last spring's floods on the Arkansas and White Rivers, have been approved by the Public Roads Administration.

Highway department crews have begun final surveys for the work.

• • •

Two irrigation projects OK'd for Texas and Idaho

The War Production Board has given the Bureau of Reclamation clearance to construct two more irrigation projects in Texas and Idaho as part of the war food program. They are the Balmorhea project in Reeves County, Tex., and the Post Falls unit of the Rathdrum Prairie project in Kootenai County, Idaho. Before construction can begin, however, authorization by the President is necessary.

The construction proposed on the Post Falls unit includes the building of a new pumping plant on the Spokane River, together with a transmission line 2½ mi. long, a sub-station, two 42-in. dia. woodstave discharge pipes, each 3,200 ft. long, a main supply canal about 1.6 mi. long, and a distribution system.

The estimated construction cost of this project is $300,000.

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Big drainage project proposed for Louisiana

Governor Sam H. Jones of Louisiana on Jan. 10 proposed a $15,000,000 project to drain and improve 11,000,000 acres of delta and prairie lands, with the cost to be shared equally by the state, the federal government and the local areas affected.

The governor described the plan as "the greatest single wealth producing project" yet submitted in his state, declaring it would save farmers $25,000,000 annually in present losses on growing crops, and would add a minimum of $240,000,000 to the value of present and potential farm lands and would benefit 47 of the 64 parishes.

Jones said the project would affect 50 percent of the state's total population, and that it had already been endorsed by Director Dewitt L. Pyburn of the state public works department, Dean J. G. Lee of the state university college of agriculture, Chairman Edgar B. Stern of the state economic development committee and the Louisiana Farm Bureau Federation.

Canadian Engineers

(Continued from page 84)

cially in regard to the excess profits tax, to permit industry to accumulate adequate cash reserves for depreciation and obsolescence of plants.

The suggestion also was advanced that the government should be ready with a reserve of public works to tide over any short period when business and industry may not be able to absorb all available labor, but it was urged that all such works should be those that represent a good business investment. Finally, it was urged that wartime control should be abolished as soon as there is no shortage of labor and materials.

Special problems discussed

Several speakers stressed the difficulty that will be experienced in getting war workers back into agricultural jobs. One speaker pointed out that the papers really presented the problems of private industry in the postwar world, not those of the entire economic system of the nation. He expressed the view that engineers should be thinking about not only private industry, but all publicly operated utilities and services, the construction industry and the big questions of public housing and the conservation of Canada's national resources. Distinction between long range planning for the postwar era and short range planning for the immediate problem of employment after the war was recommended.

Construction after the war

Hugh G. Cochrane, Montreal, analyzed the position which the construction industry may be expected to assume in dealing with postwar conditions. The total volume of construction in Canada in 1941 reached the record maximum of $640,000,000 and the estimated volume for 1944 is $350,000,000. Mr. Cochrane suggested that the maximum volume could be expected to rise to $500,000,000 in the first year after hostilities ceased, $650,000,000 in the second year, and $800,000,000 for the third and succeeding years. These figures presuppose that plans will be ready and all financing arrangements made. On the basis of an annual volume of $500,000,000, 192,000 workers would be directly employed, 34,000 salaried employees, and 253,000 workers employed indirectly, or about one worker to each thousand dollars expended. This indicates that 13,000 new workers could be absorbed by the construction industry in each month of the first three years.

C. J. MacKenzie, acting president of Canada's National Research Council, pointed out the absolutely essential place that research must occupy in any sound economy, illustrating his remarks by some dramatic figures showing the mortality of industries not active in research. Before the war, he said, research occupied a negligible position in the Canadian economy, Canada having existed on "technological blood transfusions from Great Britain and the United States." In 1935, Russia spent $3 on research, United States $2.40, Great Britain, $0.70, and Canada, $0.22.

DeGaspé Beaubien, president of the Engineering Institute of Canada

Shipshaw power development

Construction and design of the great Shipsaw power project on the Saguenay River was described by H. G. Acres, consulting engineer on the project for the Aluminum Company of Canada, in an illustrated talk which was supplemented by comments from engineers from the company's staff, the contractor and the manufacturers of the electrical and hydraulic equipment.

The Shipshaw project completes the development of the 350-ft. head between Lake St. John and sea level at Chicoutimi, Que., taking water from behind the Chute a Caron dam and carrying it through a channel about 1 mile long to a point where a head of 208 ft. can be developed. The power house is equipped with 12 hydraulic turbines rated at 85,000 hp. but capable of generating over 100,000 hp., all of which are now installed and operating, so that well over 1,000,000 hp. is being generated in the station. The Chute a Caron station remains as a standby plant.

The project was started in midsummer, 1941. The first unit went on the line November 24, 1942, 15 months after the start. The twelfth unit went on the line Christmas eve, 1943.

In the discussion, it was revealed that unusually high efficiencies had been obtained, the water-wheel efficiency being 94.5 percent, a world record.

Inter-society cooperation

At the business meeting a proposed new by-law was ordered sent to ballot which would empower the council of the institute to "enter into an agreement with any Canadian, British or American society or societies of engineers" for carrying out cooperatively the functions of the institute. Under another proposed by-law, one counselor may be elected to the council by each society or association having a cooperative agreement with the institute. There are such agreements with four of the eight provincial professional associations.

The proposed arrangement is designed to facilitate much closer cooperation between the institute and the engineering societies in this country and in Great Britain. Such an agreement with the American Society of Mechanical Engineers already has been formulated. If the by-law is approved, that society may elect to the council of the institute a representative from among its members in Canada, provided he also is a member of the institute.

Technical institutes

C. R. Young, dean of engineering, University of Toronto, reported to the meeting that the council had approved a suggestion of his that the institute endorse the setting up in Canada of technical institutes by the provincial departments of education in which could be given subprofessional training superior to that now given in technical schools, yet not of the same professional character as that given by the Canadian universities. Dean Young indicated that such technical institutes would be necessary in dealing with the educational problems that are going to arise after the war. Canada plans to provide all men discharged from the armed forces who are qualified to proceed to higher education with the equivalent of one month's training at a university for each month's service.

New president

DeGaspé Beaubien, consulting engineer, Montreal, was inducted into office as president at the annual meeting, succeeding K. M. Cameron. Mr. Beaubien was born in Outremont, Que., May 18, 1881, and graduated from McGill University in 1906. After a brief period at the university he was with the Westinghouse Electric & Manufacturing Co. at East Pittsburgh until 1922 when he became a partner in the engineering firm of Beaubien, Busfield & Co., Montreal. In 1927 the firm name was changed to DeGaspé Beaubien & Co.

JOBS OF THE WEEK

SHIPS PIER, etc., Earle, N. J.

Bureau of Yards & Docks, Navy Dept., Washington, D. C., awarded a contract for ships pier, connecting trestle and widening existing pier, at Naval Ammunition Depot to J. Rich Steers, Inc., New York, N. Y.; double tracking railroad between depot and pier, to George M. Brewster & Son, Inc., Bogota, N. J.; dunnage yard and personnel structures, to Tuller Construction Co., Red Bank, N. J.; in transit yard to Corbetta Construction Co. and Walsh Construction Co., New York, N. Y. The total estimated cost is $20,000,000. This is a joint project, the Navy will construct and the Army will finance.

COMPLETING HANGAR, Norfolk, Va.

Doyle & Russell, Columbus, Ga., has been awarded a contract for completing hangar and refrigeration for low pressure altitude chamber construction at Naval Air Station and Naval Operations Base, by Bureau of Yards & Docks, Navy Dept., Washington, D. C., at $1,471,735.

GRADING, PAVING RUNWAYS and PARKING AREAS, El Centro, Calif.

Bureau of Yards & Docks, Navy Dept., Washington, D. C., awarded a contract for grading and paving runways and parking areas, Marine Corps Air Station, to Ferry & Polk, Los Angeles, Calif., at $1,768,517.

EARTHWORK, Arkansas.

U. S. Engineers, Vicksburg, Miss., received the lowest bid for 3,926,000 cu. yd. of earthwork on west bank of Mississippi River in Chicot County, Ark., from Sternberg Dredging Co., St. Louis, Mo., at 17.38 cents per cu. yd. The estimated cost is over $500,000.

EARTHWORK, Arkansas and Mississippi.

U. S. Engineers, Vicksburg, Miss., received low bids for constructing approximately 4,698,000 cu. yd. of earthwork on the east bank of the Mississippi River in Washington County, Miss., and on the west bank in Chicot County, Ark., from Hopper Construction Co., Jacksonville, Fla.; Robert Lee, Inc., Manning, S. C.; Pioneer Construction Co., Dyersburg, Tenn.; and from T. L. James & Co. and Guilliams Brothers, Ruston, La. The estimated cost is $1,000,000.

REBUILDING PIER, Philadelphia, Pa.

Charles F. Vachris, Inc., Brooklyn, N. Y., has been awarded a contract for rebuilding Pier No. 5 at Navy Yard by Bureau of Yards & Docks, Navy Dept., Washington, D. C., at $688,925.

ALTERING and EXPANDING ORDNANCE PLANT, Decatur, Ill.

U. S. Engineers, Chicago, Ill., awarded a contract for expanding Victory Ordnance Plant to National Concrete Fireproofing Co., Cleveland, O., at $626,491.

AIRPORT IMPROVEMENTS, Wilson, N. C.

Bureau of Yards & Docks, Navy Dept., Washington, D. C., awarded a contract for airport improvements, including grading, draining and paving, to E. W. Grannis, Fayetteville, at $1,157,980. Robert & Co., Jacksonville, Fla., are the engineers and architects.

MOLE TYPE BREAKWATER, Terminal Island, Calif.

Guy F. Atkinson Co., Long Beach, Calif., has been awarded a contract for constructing 10,000-ft. mole type breakwater by Bureau of Yards & Docks, Navy Dept., Washington, D. C. The estimated cost is $3,500,000.

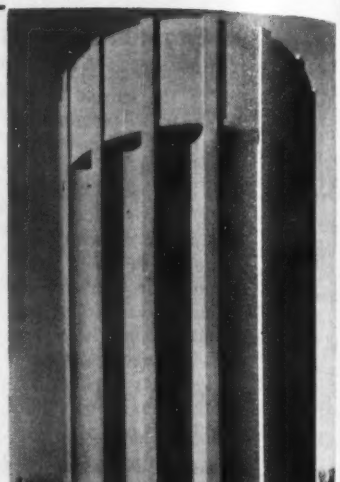
AIRPORT EXCAVATION, Danville, Va.

Civil Aeronautics Administration, La Guardia Field, Jackson Heights, N. Y., received the lowest bids on excavation at Municipal Airport from Mechlenberg Construction Co., Durham, N. C., at $508,463. The same bidder also offered the low bid on excavation and concrete paving at $1,241,748, and on excavation and blacktop paving at $1,240,588. F. D. Cline, Raleigh, N. C., was low on concrete paving alone at $703,725; and on blacktop paving only at $702,660.

AQUEDUCT PIPE for SALT LAKE DEER CREEK RESERVOIR, Provo, Utah.

Bureau of Reclamation, Provo, awarded a contract for constructing 2.5 miles of 8 ft. diam. monolith aqueduct and 7.9 mi. 69 in. diam. reinforced concrete pipe for Salt Lake-Deer Creek Reservoir Aqueduct to Carl B. Warren, Spokane, Wash. The estimated cost is $1,200,000.

Note—Additional bidding and contract news on many projects large and small appear in the Construction News section beginning on page 217.



Topeka's concrete tank called "Peoples Tower"

A reinforced concrete water tank recently completed at Topeka, Kan.,—the first elevated storage in that city—has been designated "The People's Tower". This title, was chosen because volunteers from several city departments as well as other townspeople helped to complete the structure when labor shortages developed.

Designed for a location in a residential area, the tower consists of a series of concentric concrete walls, the outer having a distinctive fluted surface accented by pilasters. On top of these walls rests a 1,000,000-gal. tank, which is 87 ft. in dia. and 25 ft. high. Design details of the tank are given in ENR July 29, 1943, p. 194.

Job safety award won by Wilmington District

The Distinguished Service Award for Safety was presented the Wilmington, N. C., Engineer District Feb. 11 for an outstanding safety record during 1943, a result of effective cooperation among government employees, contractors and engineers.

During 1943 the district had an average of only 5.79 accidents per million man hours, compared with an average of 7.71 for the entire South Atlantic Division.

The award was presented by R. L. Jenkins, of the safety and accident branch Office of Chief of Engineers, and was received by Major E. O. Smithfield, district safety officer. The Wilmington district is headed by Lt. Col. J. T. Knight, Jr., district engineer.

OBITUARY

Virgil M. Palmer, 62, superintendent of the industrial engineering department of the Eastman Kodak Co., Rochester, N. Y., died there on Feb. 16. Mr. Palmer is best known in the civil engineering field for his activity in engineering registration, being chairman of the New York State registration board at the time of his death, having served continuously on the board since it was organized. He was a past president of the National Council of State Boards of Engineering Examiners.

Robert P. Nelson, 79, who until his retirement in 1929 was senior member of the contracting firm of Nelson & Co., of Racine, Wis., died Feb. 2.

William E. Perdew, 54, prominent Kansas engineer, died in Wichita Feb. 12. During World War I he was associated with the U. S. Bureau of Mines, and after the war was a member of the allied petroleum commission of the Department of the Interior.

John Patrick Haynes, 87, veteran contractor, died at San Antonio, Tex., Feb. 1.

Earle Nelson Parker, 63, district engineer of the Georgia State Highway Department for many years, died at Gainsville, Ga., Feb. 2. Mr. Parker had been with the highway department since 1920, as district engineer at Gainsville for six years, and later at Dublin. He had only recently been transferred to Atlanta.

Frank W. Valliant, 79, retired civil engineer, died Feb. 11 near Greenville, Miss. He served several years as a street commissioner at Greenville and was at one time chief engineer for the Wabash R. R.

H. R. Seward, 80, former city engineer of Waco, Tex., died there Jan. 16.

F. L. Townsend, 75, contracting engineer and builder, died at Tulsa, Okla., Feb. 9. Mr. Townsend had been actively engaged in the contracting business in Oklahoma for the past 18 years.

C. W. Ennis, 70, prominent contractor of Houston, Tex., for 18 years, died Jan. 20.

Adolphus E. VanHorn, 52, engineer and architect of Fort Worth and Dallas, Tex., died at Fort Worth Jan. 25. He was the Defense Plant Corporation's supervising engineer at the North American Aviation plant near Dallas, and he had worked on the Childress Army Air Field.

E. Wilson Crowder, 55, of Charlotte, N. C., general superintendent of Blythe Brothers Construction Co., died Feb. 6 at Greenville, N. C., where he had been directing the construction of a large government project.

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Illinois engineers protest law evasion

A protest from the Illinois Society of Engineers over a proposal of the Board of Supervisors of Boone County, Ill., to call for bids for the position of county superintendent of highways has resulted in a decision to abandon that plan.

When the six-year term of S. W. Carlson, the present incumbent, was drawing to a close, he asked for an increase in his salary from $200 a month to $270 if reemployed. This was opposed within the board, and as an alternative it was proposed to attempt by advertising for bids for the job, to find a superintendent who would work for less, evading a requirement of law that the supervisors must fix the salary through the device of publishing a separate advertisement covering the fixing of the salary.

The Illinois society objected to the call for bids on the job, and recently has been advised that the plan was abandoned.

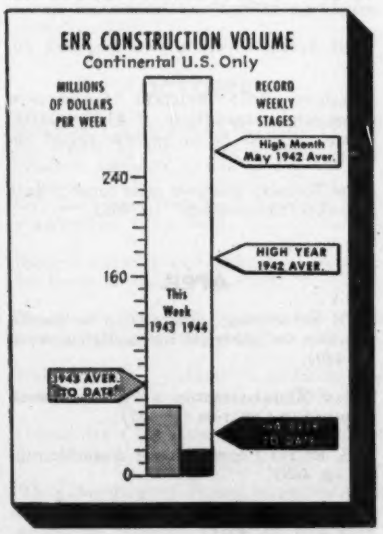
News of the Week
Continued on p. 201

CONTRACTS AND CAPITAL

CIVIL ENGINEERING construction volume in continental U. S. for the short week due to the Washington's Birthday holiday totals $22,161,000. This volume, not including the construction by military engineers abroad, American contracts outside the country, and shipbuilding, is 60 percent below the total for the corresponding 1943 week, and compares with $37,043,000 for last week.

Public construction is 51 percent lower than in the 1943 week, and private work is down 81 percent compared with the week last year. Federal construction, 57 percent below a year ago, is responsible for the public decline as state and municipal work is 351 percent higher.

The current week's construction brings 1944 volume to $274,396,000 for the eight-week period, a decrease of 48 percent from the $533,068,000 for the period in 1943. Private construction, $53,231,000, is 2 percent above last year, but public construction, $221,165,000, is down 54 percent due to the 11 percent decrease in state and municipal work and the 56 percent drop in federal volume.



In the classified construction groups, gains over the preceding week are in commercial buildings, earthwork and drainage, and streets and roads. Increases over the 1943 week are in waterworks, earthwork and drainage, and streets and roads.

New capital for construction purposes for the week totals $2,977,000, and is made up entirely of state and municipal bond sales. The week's new financing brings 1944 volume to $158,801,000, a total that compares with $15,539,000 for the opening eight weeks of 1943.

CONTRACTS

Continental U. S. Only
(Thousand of Dollars)

	Week Ending Feb. 25 1943	Feb. 17 1944	Feb. 24 1944
Federal	$38,899	$33,531	$16,749
State & Municipal	544	1,219	2,453
Total public	$39,443	$34,750	$19,202
Total private	15,203	2,293	2,959
TOTAL	$54,646	$37,043	$22,161
Cumulative 1944 (8 weeks)			$274,396
1943 (8 weeks)			$533,068

Note: Minimum size projects included are: Waterworks and waterways projects, $15,000; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000.

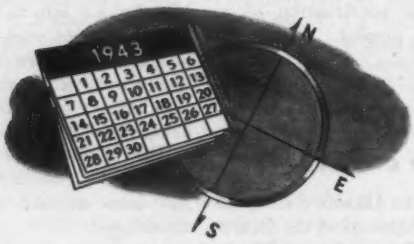
NEW PRODUCTIVE CAPITAL

	Cumulative 1943 8 weeks	1944 8 weeks
NON-FEDERAL	$15,539	$67,969
Corp. Securities	....	47,176
State & M.un.	14,039	15,218
RFC Loans	1,500	5,575
FEDERAL	....	$90,832
TOTAL CAPITAL	$15,539	$158,801

ENR INDEX NUMBERS

Index base=100		1913	1926
Construction Cost.	Feb. '44	295.05	141.83
Building Cost.	Feb. '44	232.03	125.43

Engineering News Events of 1943



JANUARY

STOP ORDERS of the War Production Board now total $1,200,000,000 (*p. 1*).

HEAVY RAINS cause floods in Pennsylvania, Ohio and Oregon (*p. 3*).

SUIT FILED against New York City for infringement of patents on land-fill method of garbage disposal (*p. 6*).

GOLDEN GATE BRIDGE in financial difficulties due to decline in traffic (*p. 12*).

FEDERAL BUDGET contains $7,000,000,000 for construction (*p. 17*).

REGULATIONS issued concerning distribution of construction materials under the Controlled Materials Plan of the WPB (*p. 17*).

WPB CANCELS work on 65 flood-control projects (*p. 19*).

OIL STARTS TO MOVE through the first section of the "Big Inch" pipeline (*p. 20*).

NEW OIL TANKER "Schenectady" breaks up at dock in Swan Island shipyard in Oregon (*p. 100*).

FINAL LINK in "Big Inch" pipeline completed (*p. 106*).

WPB EASES restrictions on private house building (*p. 107*).

QUEENS-MIDTOWN vehicle tunnel at New York closed midnight to 6 a.m. to save power (*p. 107*).

FEBRUARY

PLANS for new oil pipeline from Texas to Illinois announced (*p. 153*).

STATE HIGHWAY DEPARTMENTS seek to raise pay scale to hold employees (*p. 164*).

LIST OF SCHOOLS for Army and Navy training program announced (*p. 169*).

CONTRACT LET for raising Ross Dam (*p. 170*) following new call for bids in January (*p. 12*).

NEW YORK CITY reveals plans for world's biggest airport (*p. 173*).

RECLAMATION BUREAU studies economic aspects of Central Valley project in California (*p. 255*).

REINFORCING BAR RESTRICTIONS relaxed by WPB (*p. 271*).

WIND WRECKS Navy blimp dock trusses on Pacific Coast (*p. 272*).

OVERSEAS CONSTRUCTION in 1942 reported to have exceeded $2,000,000,000 (*p. 274*).

MARCH

POOLING of road maintenance equipment proposed by WPB (*p. 321*).

ALASKA HIGHWAY to be widened to 24 ft. throughout (*p. 322*).

POSTWAR CONSTRUCTION LEGISLATION introduced into Congress (*p. 333*).

TRANS-ISTHMIAN HIGHWAY at Panama to open April 1 (*p. 336*).

ARMY SIGNS first contract for training students in colleges (*p. 337*).

HIGH-LEVEL TOLL BRIDGE over the Thames River at New London opened to traffic (*p. 326*).

EXPANSION of activities of U. S. Bureau of Reclamation urged on WPB to increase food supply (*p. 397*).

WPB ALTERS CONTROL over roadwork (*p. 404*).

AMERICAN ROAD BUILDERS ASSOCIATION recommends expenditure of $3,000,000,000 a year on roads in the postwar period (*p. 407*).

POOR WELDING and poor steel cause failure of tanker "Schenectady" (*p. 405*).

APRIL

WPB ESTABLISHES new section to handle priorities on materials for sanitation work (*p. 449*).

URBAN REHABILITATION as postwar work proposed in Congress (*p. 465*).

U. S. BEGINS PRODUCTION of synthetic rubber (*p. 465*).

DELAWARE AQUEDUCT begins to serve New York City (*p. 465*).

WPB EASES RESTRICTIONS on manufacture of spare parts for construction equipment (*p. 517*).

ARMY ENGINEERS begin recruiting construction men for work abroad (*p. 519*).

ADDITIONAL WORK on Gila irrigation project and at Grand Coulee Dam authorized by WPB (*p. 521*).

NAVY'S TRAINING PROGRAM for engineer officer candidates announced (*p. 525*).

WPB RESTRICTS MOVEMENT of labor from jobs in essential industries (*p. 531*).

POSTWAR ROAD PROGRAM calling for federal expenditures of $1,000,000,000 per year for three years introduced into Congress (*p. 532*).

AMERICAN INSTITUTE OF STEEL CONSTRUCTION abandons bridge competition for duration (*p. 534*).

SERIOUS FLOODS occur in the Missouri River (*p. 535*).

CIVILIAN USE of Alaska highway restricted (*p. 645*).

CONSTRUCTION EXPENDITURES down 32 percent in first quarter of 1943 (*p. 647*).

MORE HOUSING in New York planned by Metropolitan Life Insurance Co. (*p. 649*).

FEDERAL postwar public works expected to total nearly $8,000,000,000 (*p. 655*).

MAY

COST of Pentagon Building in Washington double the original estimate (*p. 656*).

"LABOR-FREEZE ORDER" of WPB modified (*p. 659*).

CHINESE ENGINEERS arrive to study American Methods (*p. 659*).

USE of federal-aid highway funds for advance planning authorized (*p. 709*).

FUNDS for Florida Canal refused by Senate (*p. 709*).

SPONSORSHIP of a society of "engineers-in-training" announced by the New York State Society of Professional Engineers (*p. 713*).

FEDERAL FUNDS total $7,000,000 granted for additional work on the Detroit Industrial Expressway in Michigan (*p. 717*).

MOEHNE AND EDER DAMS in Germany wrecked by Royal Air Force bombers (*p. 719*).

SERIOUS FLOODS develop in Midwest and Southwestern states (*pp. 720* and *767*).

WPB SETS UP new facilities review committee to further curtail construction on all but essential war projects (*p. 721*).

PLANS for a "Seadrome" route across the Atlantic revived in application to the Civil Aeronautics Board (*p. 724*).

BUREAU OF YARDS AND DOCKS abandons cost-plus-a-fixed-fee contracts (*p. 772*).

CHICAGO asks authority to divert more water from Lake Michigan for sanitary purposes (*p. 775*).

ENGINEER TROOPS tackle flood protection work in the Midwest (*p. 770*).

JUNE

FEDERAL-AID highway funds released for reconstructing flood-damaged roads in Midwest (*p. 781*).

NATIONAL RESOURCES PLANNING BOARD reduced to a skeleton organization by a Senate action (*p. 783*).

PROVISION for "engineers-in-training" added to the model registration law for engineers (*p. 785*).

ARMY TO USE war prisoners for non-military projects (*p. 849*).

POSTWAR flood control plans of the Army Engineers placed before Congress (*p. 850*).

JOHN F. STEVENS, Panama Canal engineer, dies at age 90 (*p. 851*).

PLANS for new Tacoma Narrows Bridge approved (*p. 852*).

WAR HOUSING to be put under controlled-materials plan (*p. 864*).

CANADIAN ENGINEERS ask exemption from provisions of Canadian labor law (*p. 913*).

NATIONAL RESOURCES PLANNING BOARD abolished by Congress (*p. 916*).

FIRST reinforced-concrete ship-shaped barge launched at San Francisco (*p. 921*).

JULY

FUNDS for reclamation projects included in Interior Department appropriations bill (*p. 1*).

SHORTAGE of qualified engineers becomes acute in war work (*p. 2*).

LAST LINK in Trans-Canada highway opened in northern Ontario (*p. 118*).

CONTROLLED MATERIALS PLAN extended to cover all construction work (*p. 121*).

CONSULTING FEES for Army work set at $25 per day (*p. 122*).

COURT ACTION would stop employment of outside engineers by New York City (*p. 124*).

MACARTHUR LOCK at the Soo put into service (*p. 124*).

REGISTRATION LAW for engineers in North Dakota goes into effect (July 15, *p. 148*).

CHICAGO'S WATER reported endangered by sewage in Lake Michigan (*p. 169*).

"BIG INCH" PIPELINE completed from Texas to the East Coast (*p. 170*).

EXPENDITURE of $50,000,000 of federal-aid funds for plans and specifications for postwar highway work approved (*p. 174*).

NEW PASSENGER TERMINAL in Montreal put into service (*p. 175*).

CEMENT PRODUCERS ordered to abandon delivered-price system (*p. 180*).

AUGUST

CONSTRUCTION WORK resumed on Colorado-Big Thompson project (*p. 243*).

RESUMPTION of work on Chicago's South Side filtration plant authorized by WPB (*p. 246*).

WORKING STRESSES for structural-grade lumber increased by 20 percent under WPB order (*p. 295*).

SPECIAL BOARD reports that no emergency action is required on Chicago's water supply situation (*p. 309*).

CORPS OF ENGINEERS to retire 900 over-age officers (*p. 309*).

CONSTRUCTION in first half of 1943 reported to be 24 percent below same period in 1942 (*p. 311*).

SEPTEMBER

SHIPMENTS of portland cement restricted to regional zones by WPB (*p. 359*).

PEACE RIVER BRIDGE on Alaska highway dedicated (*p. 360*).

LEON S. MOISSEIFF, bridge engineer, dies (*p. 372*).

WAR DEPARTMENT issues regulations covering termination of construction contracts (*p. 373*).

BUREAU OF RECLAMATION to be decentralized (*pp. 427* and *445*).

USED CONSTRUCTION EQUIPMENT sought by the Army and Navy (*p. 495*).

ARMY ENGINEERS build new road from India into Burma (*p. 496*).

LARGEST federal housing project scheduled for construction in Chicago (*p. 502*).

URBAN REDEVELOPMENT ACTS adopted in five states (*p. 504*).

OCTOBER

BUILDING TRADES STRIKE in Houston ended by drastic action of the Federal Public Housing Authority (*p. 509*).

CHICAGO'S SUBWAY to go into regular operation on Oct. 17 (*p. 563*).

ARMY ENGINEERS withdraw forces from Inter-American highway (*p. 565*).

BRAZILIAN railroad construction job awarded to American contractors (*p. 569*).

RESUMPTION of civilian construction discussed at WPB conference (*p. 575*).

OKLAHOMA CITY plans vast mid-continent airfield (*p. 575*).

WAGE ADJUSTMENT BOARD reconstituted to include jurisdiction over private wage dispute cases (*p. 577*).

BRIDGE with a movable span that is submerged to open the river channel built in Iraq (*p. 578*).

ACCREDITING of engineering courses by Engineers Council for Professional Development curtailed due to the war (*p. 644*).

COLLECTIVE BARGAINING GROUPS in local sections authorized by American Society of Civil Engineers (*p. 645*).

NAVY construction program 85 percent finished (*p. 652*).

NOVEMBER

MORE STRUCTURAL STEEL made available by by the WPB (*p. 659*).

GUATEMALA to finish section of the Inter-American highway within its borders (*p. 662*).

MORE STRUCTURAL STEEL made available by WPB for construction operations (*p. 713*).

REFLOATED *U.S.S. Lafayette* (Normandie) taken from the slip where it burned and sunk to a drydock for rehabilitation (*p. 713*).

CONSERVATION ORDER L-41 amended by WPB to simplify compliance by contractors (*p. 723*).

PRODUCERS COUNCIL estimates total construction in postwar years at $16 billion (*p. 732*).

ARMY war construction program nears completion (Nov. 18 issue *p. 132*).

CONGRESS begins hearings on postwar planning bills (*p. 777*).

POLLUTION CONTROL PROGRAM for the Ohio River recommended to Congress (*p. 184*).

DECEMBER

PENNSYLVANIA lets contract to private firms for surveys and preparation of plans for proposed Penn-Lincoln Parkway at Pittsburgh (*p. 792*).

INFLATED-BAG FORMS fail in construction of dome shaped building at Los Angeles (*pp. 793* and *871*).

POSTWAR BUILDING PLAN offered to Congress by U. S. Chamber of Commerce (*p. 855*).

WING COMDR. GUY P. GIBSON gives more details of bombing of German dams (*p. 860*).

COURT holds large postwar housing projects of the Metropolitan Life Insurance Company in New York City constitutional (*p. 864*).

DEPARTMENT OF LABOR estimates that total construction will decline from $7.4 billion in 1943 to $4.2 billion in 1944 (*p. 869*).

DEPARTMENT OF COMMERCE sets total construction for 1943 at $7.7 billion (*p. 917*).

COLORADO-KANSAS water dispute settled by U. S. Supreme Court (*p. 918*).

RELEASE of 600,000 construction workers between September 1943 and July 1944 anticipated by the War Manpower Commission (*P. 931*).

Official O.W.I. Photo.

American and British engineers and construction equipment work together in removing battle debris from Naples, foreshadowing a post-invasion task that will be duplicated in many other European cities during 1944.

★ ★ ★ ★ ★ ★ ★ ★ ★ ★

EVIEW AND FORECAST—1943-1944

IN COMMON AND OFTEN IN COMPANY with thousands of American soldiers, the American engineer and construction man in 1943 transferred his energies from the home front to the war front. From concentration of every ounce of his effort in 1942 on one objective—the building of munition factories and training camps—he turned, in 1943, to spreading these energies around the globe, deploying them to tasks and places where they could more directly aid the fighting forces. Spectacularly successful in the first, he was superlatively effective in the second.

In his recent annual budget message, President Roosevelt referred to these two years as the periods of "defensive war" and "aggressive development". The terms fit the activities of engineering construction. And the President's name for the period coming up—"offensive war"—is also apropos, for construction men are now ready to lend their energies to the attack. What we have been working for must now be fought for.

ollars an Inaccurate Measure

HAT CONSTRUCTION ACCOMPLISHED in 1943 is not operly measurable in the usual manner, that is, llars of contracts let. On such a basis, the year s a mediocre one indeed. Its five to seven bilns of contracts (by various estimates) was less n half the volume chalked up in 1942, yet most gineers and contractors and all equipment and terial manufacturers were fully employed. The swer is found in the diverse war tasks to which il engineers and construction men bent their orts. Large numbers went into the armed servs—the Corps of Engineers, the Seabees and the arines—and their extensive construction work all er the world is not a part of the contract total. hers built ships or even found employment in aircraft industry. Some were engaged in the ally important activity of postwar planning, and s, of course, was design work that did not show in the statistics of contracts. Still others, whose orts are not recorded, worked on secret war conuction projects. It was an abnormal year accordg to normal methods of measurement. But it was busy and a productive year according to the only ndard that counts these days—advancement of war effort toward victory.

ome Front and War Front

NE OF THE DEFINING characteristics of this unual year was that its activities—measured either men engaged in construction or money spent on construction of facilities—were about equally divided between the home front and the war front. Another was that home front activities were of two types, those concerned with serving the immediate needs of the fighting men and those whose objective related to the needs of these same men when their fighting is done. Of the two there is no doubt about which was the more urgent, but he would be clairvoyant indeed who could rate which was the more important. Significantly, however, the urgent tasks were brought under such satisfactory control in 1943, that both energy and time could confidently be expended on preparations for peace.

This issue, whose purpose is to survey the accomplishments, the problems and the consequences of our second year of war, is also devoted about equally to home front and war fronts. Moreover, in addition to the usual review of the technical fields and the presentation of the statistical picture of the construction industry, special emphasis is given to a number of the year's more significant developments in separate articles.

On the war fronts, the substantial and heroic accomplishments of our Army Engineers, Navy Seabees and Marine Corps Engineers will long be remembered with pride and appreciation. What these accomplishments were is told in three revealing articles. On the home front, significance attaches more to problems and their consequences than to accomplishments, although New York City's splendid solution of the problem of postwar public works is also an accomplishment of high order.

Aleutian island airfield being "assembled". Used for runway surfaces throughout the whole Pacific theater, these pierced steel planks are literally the stepping stones to Tokyo.

Similar comment applies to the superb handling on the part of the engineering colleges of the problem of Army and Navy personnel instruction, while at the same time keeping everything in readiness for a quick shift back to a peacetime engineering education basis. Both of these subjects are treated in detail in separate articles, as are two other problems whose consequences commanded attention, namely the construction equipment supply situation and the prospects for a postwar housing boom.

There were other developments and problems, but these few were among the most important. Overlapping and intermingled with them, of course, were the day-to-day complications of a wartime economy, whose effect on civil engineering and construction practice will be apparent in the reviews that follow.

Business and Professional

BUSINESS CONDITIONS for both engineers and contractors became spotty toward the end of the year. Contractors who had gone into shipbuilding continued busy, but as other war jobs drew to a close, many of the others found new work difficult to get. This condition was reflected in the large number of bids on such work as was let to contract late in the year.

Consulting engineering work fell off even more sharply. One sign of this was the pressure brought on engineering societies to urge the federal government to curtail the encroachment of federal engineering agencies on the field of private engineering practice, especially in South and Central America. Another sign, seen from a different viewpoint, was the court action brought by the Civil Service Technical Guild in New York City to restrain the city authorities from letting contracts to private consultants for engineering work on postwar projects. Though that action was not successful, it is indicative of a trend that is of concern to all who believe that the private consultant serves a useful purpose in the nation's economy.

With respect to manpower, no group of professional men was as hard hit perhaps as the sanitary engineers. Procurement agency figures of the year-end showed a total of 5,752 engineers classified according to experience, of which 1,223 were commissioned in the armed forces (800 in the army Sanitary Corps), and 515 declared essential in civilian activities. Civilian sanitation services are now critically short of men.

Outstanding among professional developments in 1943 was the decision of the American Society of Civil Engineers to authorize its local sections to set up committees to act as collective bargaining agents for professional engineering employees when the occasion for such bargaining arises. The move is largely defensive, designed to help engineering

ployees to keep from being forced into trade ions against their will.

Another move made in the interests of young gineers was the setting up under the license laws New York and Ohio of the "engineer-in-training" a legally recognized classification. Young engi- ers who pass the license board's examination engineering theory are given that rating until ch time as they gain the necessary practical perience for a full license. Late in the year, ovisions covering "engineers-in-training" were ded to the model registration law.

North Dakota put an engineer registration law o effect during the year, leaving only Montana d New Hampshire without such laws. The newly acted general engineer license law in Illinois was clared unconstitutional toward the end of the ar. Illinois has had a structural engineer license w on its statute books for many years.

PB Called the Tunes

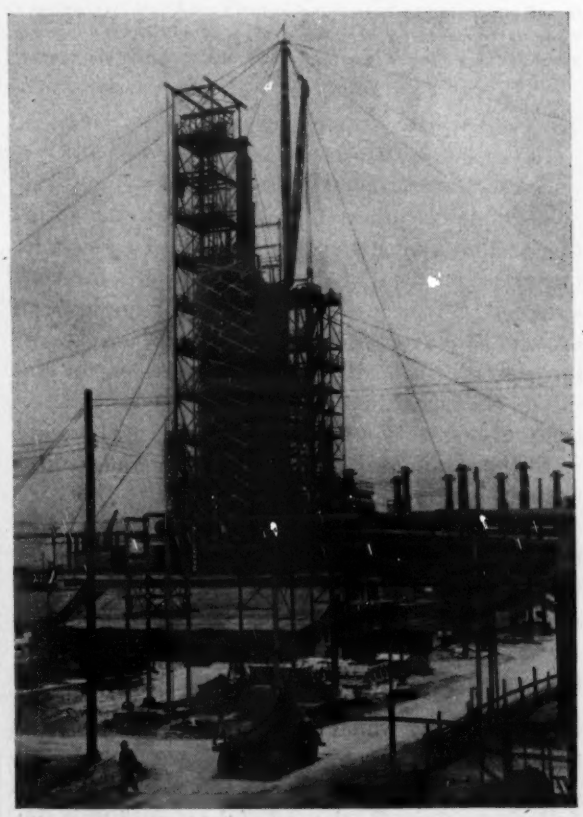
S IN THE OTHER TWO YEARS since Pearl Harbor, a eam of orders, directives and interpretations ntinued to flow from the War Production Board. e principal order governing construction, how- er, Conservation Order L-41, requiring WPB pproval of projects before starting work, remained full force except for minor changes. These were rgely in the direction of translating legal phrase- logy into simple English, as a stimulus to better mpliance. Two other major WPB orders affect- g construction, L-192 and L-196, relate to equip- ent and are discussed in the article on p. 281. ost of the new WPB orders concerned the pro- uction, distribution and use of particular products d materials. There were, by the end of the ar, for example, 17 orders in effect on lumber one. The most far reaching change in WPB rocedure related to the Controlled Materials Plan, hich was placed in operation during the second uarter of the year. Under its provisions, priority tings were no longer enough to get steel, copper d aluminum, which were allotted directly by PB to specific projects or equipment manufac- rers. Ratings, however, continued to be required r other critical materials.

Construction stop orders pursued pretty much of off-again, on-again trend. They were relatively merous, the most widely known ones involving clamation projects. Toward the end of the year, materials requirements for war were being met ore easily, there was talk of resuming some vilian goods manufacture. But WPB quickly pointed out that until the war in Europe took a decisive turn in our favor, civilian work would have to wait. Materials might be available, but manpower was not.

Construction Technique

SINCE CONSTRUCTION has gone to war, current changes in construction technique are largely war developments. Navy Seabees, Army Engineers and the contractors engaged in offshore projects have had, by necessity, to improvise, to substitute, to get along without, and to use materials and equipment in ways never thought possible. American mechanical and construction ingenuity has never shown up to better advantage.

Examples range all the way from use of bally poles and scrap packing case lumber for repair shops in Iran to ripping surface rock with rooters and then crushing it in place for road surfacing at Amchitka in the Aleutians; from steam-thawing gravel pits at Nome to shoving a sand dune into a swamp for an emergency airport at Cap Bon.



Outstanding among rush construction jobs on the home front in 1943 was the building of synthetic-rubber-making facilities. Erecting distillation towers, such as this one at Monsanto Chemical's Texas City styrene plant, was one of the tasks involved.

Great progress has been made in laminated timber construction, as represented here by arches of 177-ft. span being erected for a hangar in a Midwest plane modification center.

Scores of equally interesting cases could be cited.

Never before has construction equipment been put to such versatile use. The bulldozer is no longer a simple earth mover, it is a combat weapon indispensable in fast-moving warfare. No longer is the crawler tractor a mere haulage unit for construction, it is now a prime mover for implements of war. Ditching machines are more than excavators for pipelines, they now dig trenches for the infantry. Trucks, shovels, cranes, wagons and air compressors are now front-line equipment. Through it all the stamina of American construction equipment is proving its worth.

Armed with such equipment our ingenious fighting forces are making construction history along with military history. They will return with many a new idea to improve peacetime construction.

Materials Paradox

FOR A COUNTRY which set out on the war construction program with complete confidence in the availability of lumber, but doubts as to steel, 1943 was full of surprises. By the end of the year, 50 percent of the lumber cut was going into overseas crating as against 12½ percent normally used for this purpose, so that construction lumber was scarce indeed. Moreover, because of manpower shortage in the forests, we ate into lumber reserves; production was about 33.5 billion board feet, but consumption was 38.5 billion. This tightness in lumber caused designers to swing back to steel, which WPB was able to release. It also caused concrete contractors to look around for steel forms to use in place of wood. Had construction volume been of boom proportions, the situation would have been serious. As is was, the end of the year found both steel shapes and reinforcing bars available in sufficient quantity to meet all demands. Throughout 1943, even more than in 1942, WPB required designers to "strip" their designs of all details not absolutely necessary, and to use all materials as sparingly as possible.

Spectacular Timber Buildings

DESPITE LUMBER SHORTAGES, however, many of the notable buildings of 1943 were built of timber. Most spectacular were the huge 1000-ft. long docks or hangars to house Navy blimps used in patroling our coastline. Each hangar provides 237,000 sq.ft. of floor space unobstructed by columns or supports of any kind. The 246-span, 140-ft. rise spandrel-braced arches of these structures, setting new records for this country and possibly for the world, were erected by various forms of traveling derricks and centering as spectacular as the hangars themselves. Huge industrial buildings also continued to be constructed with timber roof framing, an assembly plant in Chicago, where Douglas produces C-54 cargo transports, utilizing 150-ft. span Pratt trusses each weighing 72 tons. A total of 27 million board feet of timber was used in this plant, probably the largest amount in a single structure in the United States. Stepping up span lengths still further were some 162-ft. crescent shaped trusses in a West Coast hangar, and even longer timber trusses were used in the San Diego plant of the Ryan Aeronautical Co., where spans of 200 ft. were attained with bowstring designs using web members in continuous X-bracing form. The top chords of most of these long trusses are of laminated construction. Such construction was also used in timber arches, some in modification center hangars at Vandalia, Ohio, having 177-ft. spans.

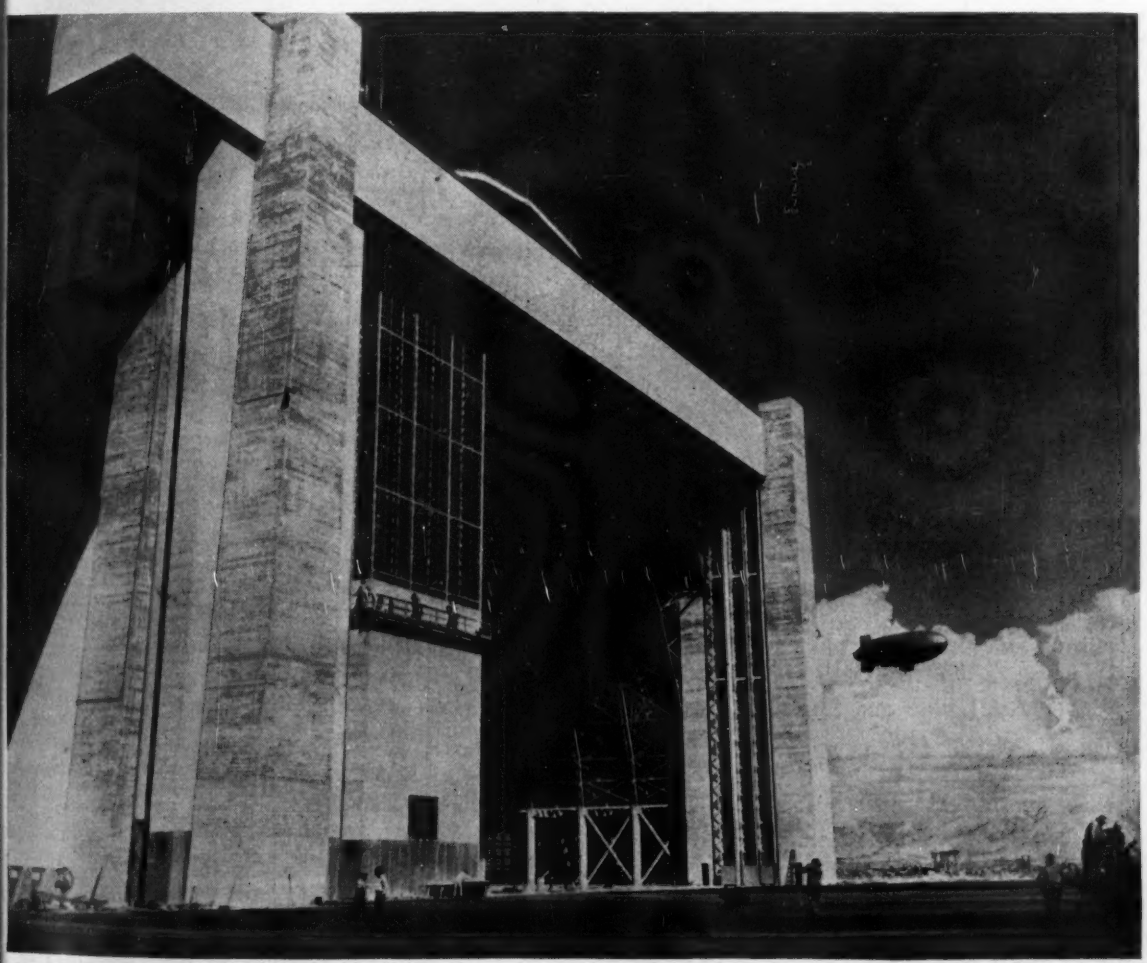
Because of the necessary use of much unseasoned material in timber buildings, difficulties have been experienced with checking and splitting. Bolts in trusses also have had to be tightened periodically since they become loose as the timber shrinks in drying out. All in all, however, the timber structures not only have proved satisfactory, but have

set new standards that will demand attention in the postwar period.

More Concrete Buildings

THE GROWING SHORTAGE of timber supplies in some areas, plus the fact that reinforcing steel was more plentiful than previously, resulted in a larger proportion of industrial buildings being built of reinforced concrete than in 1942. One of the notable reinforced-concrete plants—for the Dodge Division of the Chrysler Corp. in Chicago—involved a main building covering 80 acres as well as eighteen smaller structures. But more important than its size was the use of multiple thin-slab concrete roof arches supported on concrete columns, in a design that required only 2.7 lb. of reinforcing steel per sq.ft. of floor space. Traveling forms permitted this type of structure to be built very rapidly. Another significant concrete building was an auditorium at a Southwest air station wherein 91-ft. span ribs having only a 25-ft. rise were used. Cast on the ground, they were raised a half-section at a time, the hinge splice at the crown consisting of a short section of 10-in. dia. steel pipe; the bottom ends of the arches were rounded to fit into recesses in the footings. One other unusual concrete building should be mentioned, although the first attempt to construct it resulted in failure. This is a spherical shell structure poured on an inflated bag form. Extremely economical of materials and providing unobstructed floor space, it offers advantages that will be examined with interest.

Precast concrete members, particularly heavy building columns, were used quite extensively, and the year marked advances in the application of the principle of prestressing. Many storage tanks were built for the Navy and Army in which the circumferential rods were prestressed in conventional manner, but the most important development was the use of a machine to wind wire around the tanks while automatically prestressing it to 150,000



Byrne Doors Inc. Photo

Most spectacular buildings of the year were the timber-framed airship docks of our coastal naval air stations. Over 1,000 ft. long and of 246-ft. span, each hangar required over three million board feet of chemically flameproofed timber.

Bridge of the year was the Peace River crossing on the Alaska Highway in British Columbia. A 930-ft. span strand-cable suspension structure, it was erected in phenomenal time despite severe winter weather and difficulties common to a remote location.

psi. or more. An unusual experiment in prestressing, used in some residence wall panels, was to pass an electric current through the wire reinforcing, causing it to lengthen. Held in that position by nuts, the reinforcing, upon cooling, introduced the prestress into the concrete.

High Octane Gas and Rubber

DESPITE THESE INTERESTING technical developments, all classes of building registered large decreases in volume compared to 1942. Yet two types of industrial facilities—plants for the manufacture of high octane gasoline and synthetic rubber—were pushed at boom tempo. Involving many miles of steel pipe and many tons of structural steel, as well as other materials, each plant presented a major construction and design job. Power houses had to be built, large water supply installations made, and many types of tanks and buildings erected. So well was the gasoline progrom handled that by April of this year 77 of the 92 plants, each costing over a million dollars, will be completed, while the synthetic rubber plant construction is almost as far advanced. Figures at the end of the year revealed that capacity for 646,000 long tons, or 75 percent of the program, was finished. In addition, plants to manufacture raw materials—butadiene and styrene—for the rubber-making plants were 55 percent complete. When the full story of the gasoline and rubber plant construction can be told, it will probably rival the records made on airplane factories in 1941 and 1942.

Hospitals Follow Training Camps

IN CONTRAST TO OTHER YEARS when training camps were built in every part of the country, a major part of the 1943 military building program was in the form of hospitals. According to the Surgeon General's Office, the estimated total construction cost for the year of both general and station hospitals was $392,552,000; the number of station hospitals is not available, but 24 new general hospitals were added. A majority of the hospitals were built with timber-frame roofs, wood floors and walls of brick or concrete block. Use of reinforcing and structural steel was limited.

To reduce the number of new hospitals to be built, some miliary camps no longer needed for

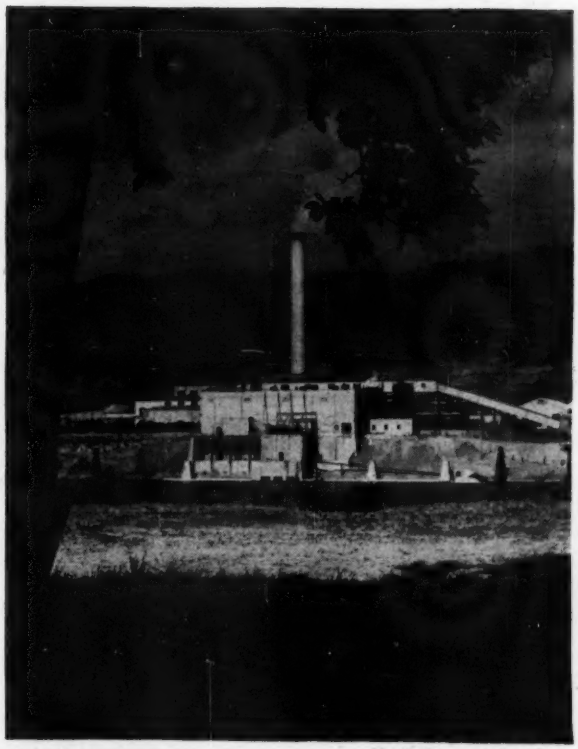
training purposes were converted to hospitals. More camps should be available for hospitals in 1944, but considerable work remains to complete the hospitals now under construction and to enlarge existing facilities.

War Housing Over the Hump

THE WAR HOUSING PROBLEM in most industrial areas was overcome in 1943, and the year witnessed completion of new or converted units totaling 575,000. Altogether, reports the National Housing Agency, some 3,400,000 units have been provided, and an additional 195,000 units are under construction. The program of publicly fianced construction is about 85 percent complete; temporary projects have averaged $2,700 per structure, including site and utility costs, compared with $4,500 average previously reported for permanent type dwellings.

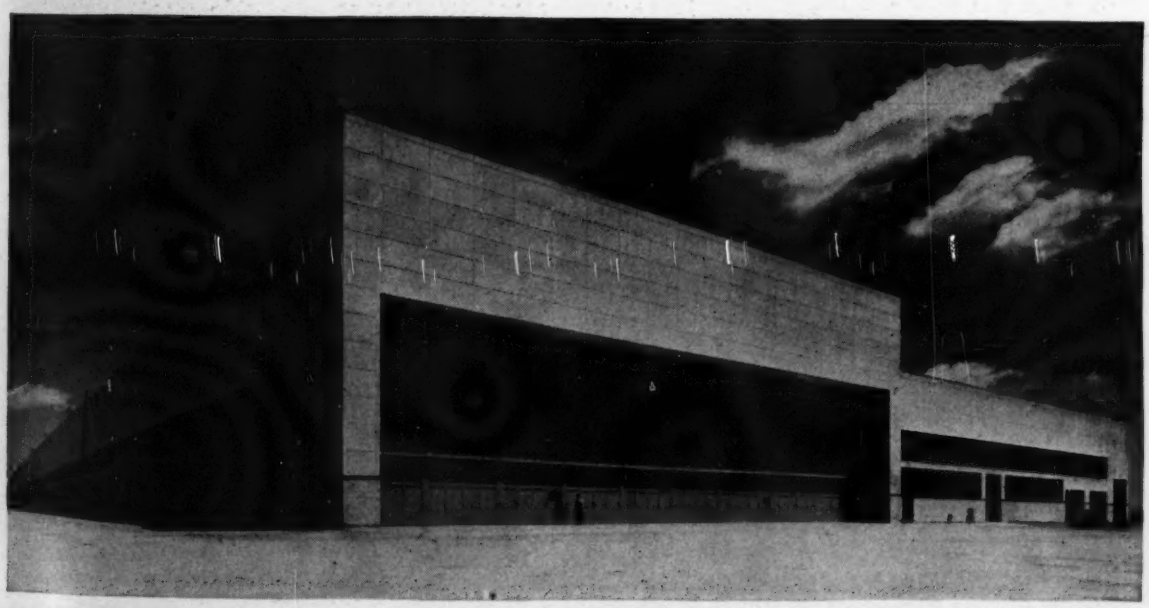
How much of the new housing construction can be usefully employed after the war is a moot question—it depends in large measure on continued high level employment by the industries adjacent to the housing areas. Nevertheless, it is estimated by the FHA that in the first year after the war, when war restrictions are removed, a five billion dollar privately financed housing boom may be anticipated to meet required needs.

Much has been gained through wartime experiences with mass housing ventures that will have a salubrious effect on postwar projects. For one thing, site selection and layout principles have been evolved that will encourage departures from the stereotype and monotonous results that heretofore have characterized public housing. And enough



H. K. Ferguson Co. Photo

Power plant and pumping station for new chlorine plant of Pittsburgh Plate Glass Co. on the Ohio River below Wheeling, W. Va., is a huge structure of reinforced concrete and brick.



Austin Co. Photo

Largest timber building, in point of amount of wood used, 27 million board feet, this Douglas C-54 transport plane plant effected a saving of 30,000 tons of critical war metals. The siding is cement-asbestos, and piping, lighting reflectors and window sash were also non-metallic.

Timber Structures, Inc., Photo

Ohio River back channel crossing near Pittsburgh, one of the notable timber bridges of 1943. Built by the Navy on a main access road serving extensive shipyards, it contains six 126-ft. timber truss spans distinguished by the use of steel gusset plates. It supplements a narrow steel bridge just downstream.

has been learned about prefabrication and on-site fabrication to permit the evolution of a new technique that will employ the best features of each in the construction of low-cost housing.

Hard Sledding for Bridge Builders

THE DROP IN 1943 CONSTRUCTION, as cited for buildings, was also painfully apparent in the field of bridge building, where the $25,000,000 that was spent was only half the previous year's total, which in turn had been about half the bridge expenditures of 1941. Yet we built more bridges than the statistics show, because they do not include those constructed on the Alaska Highway, which were numerous and substantial. Most spectacular was the 930-ft. span suspension structure over the Peace River, but there were others, such as a similar suspension bridge of 600-ft. span over the Lower Liard, two 400-ft. span through steel cantilevers over the Tanana, and several long crossings containing a series of 200-ft. steel truss spans. Timber trusses of 160-ft. span, both deck and through type, long timber trestles, rolled steel girder spans and a number of concrete deck slab structures represent other types built. In all, the Alaska Highway program involves 165 permanent bridges, about half of which were completed in 1943.

In the U. S. work was begun on a new railroad crossing of the Pecos River canyon in Texas, which will be a steel cantilever span on piers 300 ft. high. The only other reminder of the good old days of interesting and large bridge projects comes from Sweden in a report that the Sando Bridge, which is a concrete arch having a 866-ft. span, had been completed.

Water supply has first priority wherever our troops land in the Pacific. Here, on an island of the New Georgia group, the distillation unit, which makes salt water drinkable, is set up right in front of the landing ships.

Over 200 ft. longer than the previous world's record span at Elsa, Spain, Sando Bridge will be remembered as the one whose falsework collapsed in 1939 as the arch concrete was being poured.

In general, however, bridge activity, other than maintenance and repair, was largely confined to essential war access roads. Grade separation structures predominated, but there were some stream crossings, and timber and concrete were the materials generally used. In the state of Washington, for example, one timber bridge was built with nine 100-ft. deck truss spans, while near Pittsburgh six 126-ft. through truss spans were built to carry 12-ton trucks and 30-ton street cars. Continued work on the Detroit Expressway brought to completion several concrete overpasses.

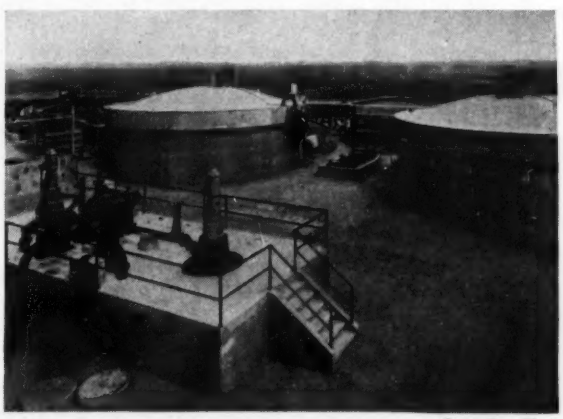
An exception to access road bridge building occurred in several sections of the Middle West, notably Missouri, Arkansas and Texas, where flood washouts had to be replaced by new bridges. Throughout the year the PRA's committee of bridge experts continued to study and discuss the problems of long span bridge design, and model testing of designs of the Tacoma Bridge, both the one that failed and the proposed new span, made substantial progress. The most encouraging development of the year was the increase in postwar bridge designing by the state highway departments; as soon as their manpower shortage can be removed, a large expansion of this activity should ensue.

Unreinforced Concrete Culverts

ONE INTERESTING ASPECT of the bridge field in 1943 was the continuation of construction of unreinforced concrete culverts and arches, although at a diminished rate as compared to 1942 since more reinforcing steel was available. The difficulty of designing unreinforced arches, their relatively high cost and their unsuitability under certain conditions are factors that will militate against such structures in normal times, but they have proved to be very useful during the emergency. Middle Western states seem to have used them most widely. During 1943, Kansas built 30 unreinforced concrete arches, from 4 to 16 ft. in size, involving 2,700 cu.yd. of concrete at a cost of $75,000; Texas built 94 box culverts in single and multiple unit types, costing $195,000 and using only about one-third of the steel required for conventional boxes; and Nebraska built 12 arch culverts of 6 to 10 ft. size, involving 1,922 cu.yd. of concrete at a cost of $56,000. Neither Texas nor Nebraska contemplate further use of unreinforced culverts when bar steel is again available, but Kansas' postwar highway plans include 40 unreinforced arches at locations where the streambeds are rock.

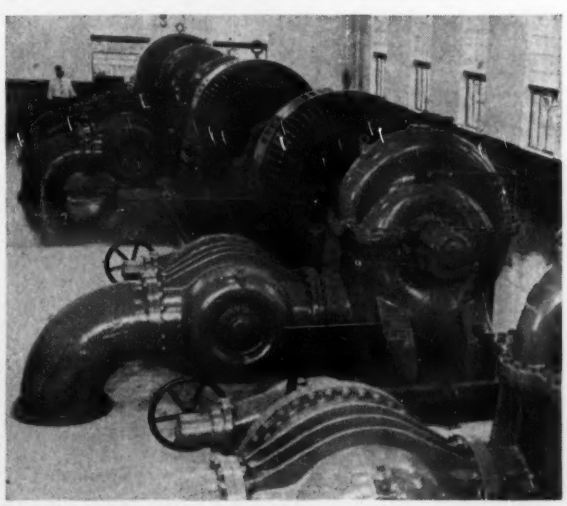
Contractors Build Ships

ONE FIELD in which construction men found no lack of work was in shipbuilding, more than 19,000,000 deadweight tons of vessels being built in 1943. Liberty freighters (1,238 vessels out of 1,896 of all classes) were the most numerous type, but in 1944 the faster, more efficient cargo freighters known as Victory ships, will predominate. No overall information is available on naval ships, but construction has been curtailed on destroyer escorts as the submarine menace has been lessened. A huge program for landing craft of all types is scheduled for 1944 in which many construction con-



Dorr Co. Photo

An advance in sewage and waste treatment was signalized by San Diego's installation of these vacuum flotation tanks to remove grease and other difficult-to-settle solids.



Municipal lend-lease to aid water supply was recorded when Philadelphia let Detroit have these four 40 mgd. pumps for a booster station to improve its service to vital war plants.

Welded rigid frame bents characterize the framing of this operation aisle in Chicago's huge 320 mgd. water filter plant, whose construction WPB permitted to be resumed as an emergency health measure.

tractors will participate in a prominent manner.

Residual stresses induced by welding continue to offer the principal technical problem of ship construction, the breaking up in rough seas of a few of the Liberty ships serving to emphasize its seriousness. The answer has been sought in more research on methods of avoiding or removing the locked up stresses and by prohibiting the forcing of parts into position in overzeal for speed.

While increase in maximum size of preassembled parts over the huge sections set during 1942 was slight, there was a very great increase in the average size of preassembled pieces, so that many fewer units now go to the ways for assembly.

The construction of concrete ships was also greatly advanced in 1943, although such ships have probably claimed more of the interest of construction men than their importance to the war effort merits. Up to the first of the year, 27 of the tanker and dry cargo barges, each about 350 ft. long with some 5,000-ton cargo carrying capacity, had been delivered. Originally intended for towing along the coast and perhaps to South America, many of the vessels are now in use as floating warehouses at advanced bases. Other warehouse barges of 2,000 long tons capacity and 265 ft. long are also under construction. Some of the big barges have been in terrific storms and have weathered them without serious difficulty, while one was victor in a collision with a steel vessel.

Up to the first of the year, two of the 366-ft. long, 4,400 ton capacity powered concrete ships had been delivered, nine more were in the water, and nine others under construction. The first of these vessels was built with a burned clay aggregate, but the later ships used a nodulized burned fuller's earth product to secure a lightweight concrete.

Floating Drydocks for Global War

SALVAGE AND REPAIR OF VESSELS has been an important part of the shipbuilding picture, and a huge program of floating drydock construction, started in 1941 and 1942 and only partially revealed this year, has produced for the United States more of this type of facility than existed in the world prior to the war. The only suggestion as to the size of the program is an official statement to the effect that it exceeds a half-billion dollars.

Many of these docks are used for servicing ships in advance areas to avoid the long trip back to established bases.

There are many sizes of drydocks in the program, with units made of steel, timber and concrete, as availability of the materials dictated. Greatest of all floating drydocks involves a new design of ship-shaped steel hull sections with wing walls that can be folded down to reduce the wind resistance in towing. Ten of these sections, taken to an advanced area and joined, make a 100,000-ton lifting capacity dock for battleships; seven sections, of a slightly smaller size, may be joined to provide a 56,000-ton dock for cruisers.

Next largest of the steel docks are 18,000-ton units with a long center section and two end sections designed so that the latter can be used to lift the center out of the water for docking. There are also many smaller steel docks included in the program.

The timber drydocks have been constructed principally for ports in continental United States, although a few of them too have been towed to advance bases. Some one-piece timber drydocks are nearly 400 ft. long, by far the largest timber vessels ever taken on open water.

The floating drydocks of concrete are of 400 ton and 2,800 ton lifting capacity. Ordinary gravel or stone aggregate is used, rather than lightweight materials as in concrete ships, and while the docks have a modified ship-line bow and stern, their construction is less complicated than that of a ship. Frames, at 8 ft. c. to c. transversely, and longitudinal bulkheads give the principal strength to the vessels.

The drydocks have been built by construction contractors at yards on all of the coasts and on inland waterways as much as 2,000 miles from salt water. Crews for operation of the docks have been recruited largely from construction men in the Navy.

Restrictions Eased on Dam Building

DURING THE LATTER PART OF 1942, the War Production Board drastically curtailed all dam building work except that on power installations at Parker, Boulder, Grand Coulee and Green Mountain dams, excluding any work that could not be brought into production by the early part of 1945. However, before 1943 ended a number of these restrictions had been lifted, notably on several dams of the Bureau of Reclamation on the plea that these

More floating drydocks than existed in the world prior to 1940 are contained in a building program brought far toward completion during the past year. Pictured is a three-piece 18,000 ton lifting capacity steel dock. End sections in foreground extend length of dock and are used as occasion requires to drydock main center section.

dams would make possible the irrigation of additional land to expand the nation's food resources. Included in this work was Keswick Dam of the Central Valley project in California. Work on Shasta Dam of that project had not been stopped.

In October, the War Production Board authorized work to be resumed on Anderson Ranch Dam in Idaho, which when completed will be the highest earthfill structure in the world, 440 ft. Resumption of work on several smaller dams also was authorized, including construction of a new dam to replace Scofield Dam in Utah, which structure is so badly deteriorated as to be unsafe. The Bureau of Reclamation also was authorized to continue work on several irrigation canals that had been stopped under the blanket stop order of the Fall of 1942.

Some Power Work Continued

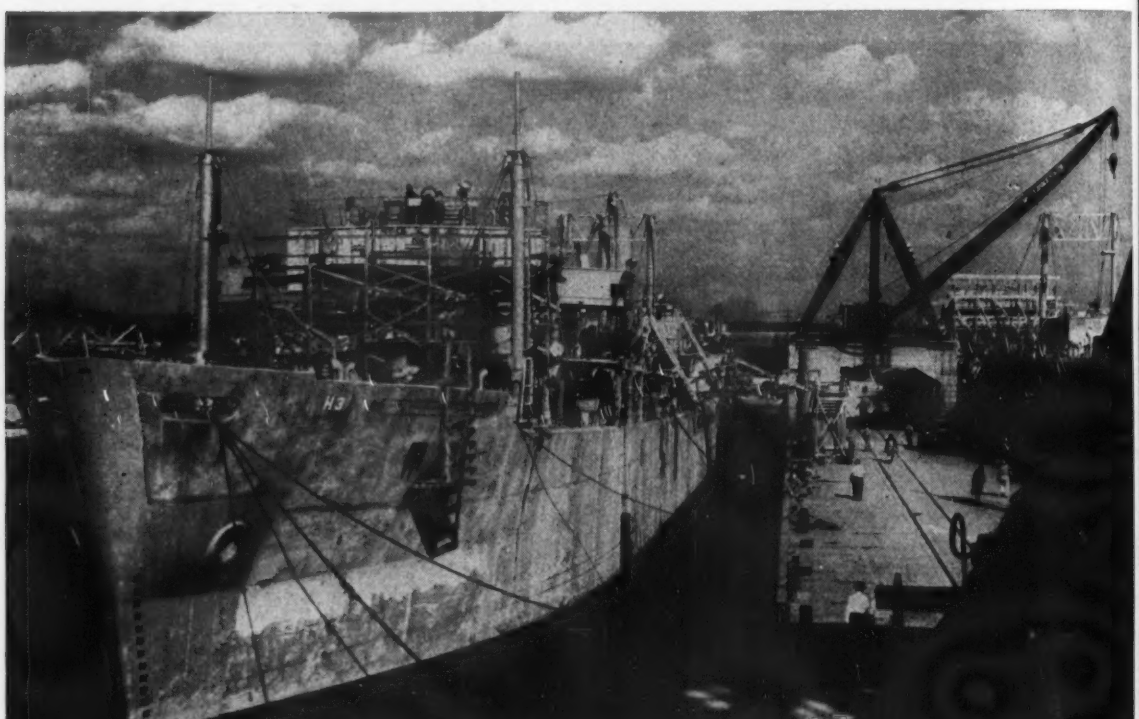
DURING THE PAST YEAR the Bureau of Reclamation added 530,000 kw. of new power units, and is installing 340,000 kw. more which will come into service this year. Future projects totaling 670,000 kw. were halted by the stop order of 1942. Seattle was permitted to go ahead with the work of increasing the height of Ross Dam, and work on Alder and LeGrande dams of the second Nisqually project near Tacoma also was resumed under a new permit.

In the Tennessee Valley, work was completed on Douglas Dam, Ocoee No. 3 and Appalachia dams. Work was continued on Fontana and Kentucky dams. Construction records were set on Douglas Dam on the French Broad River, which was closed on Feb. 21, 1943, less than 13 months after the work was authorized. This was made possible by adopting the design previously used for Cherokee Dam, the two sites being very similar. Fast progress is being made on Fontana Dam, despite delays due to high water this spring.

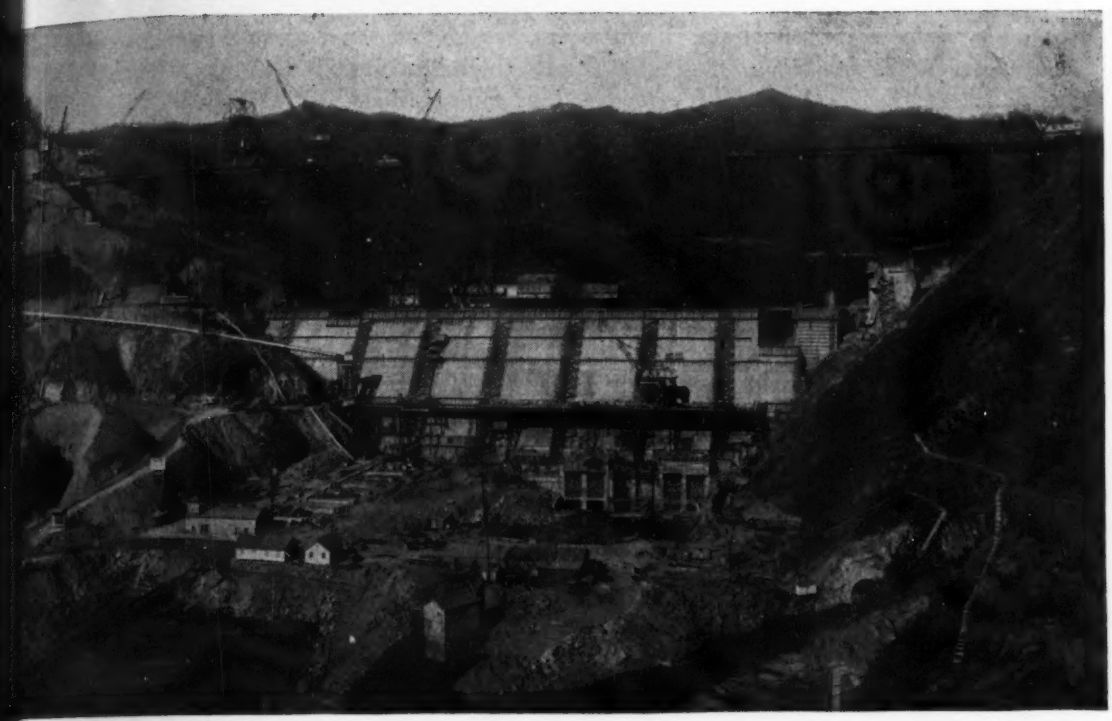
Most spectacular of the power developments to come into service this year was the second stage of the Shipshaw development on the Saguenay River in Quebec where two 85,000 hp. units were put into service early in February, 1943, less than 15 months after the start of work on that great project. Six 85,000 hp. units are being installed under the current operations in a plant that ultimately will have a capacity of 1,000,000 hp., giving the project third place among the world's big power plants.

Flood Control

SERIOUS FLOODS OCCURRED in several river valleys in Southwestern and Midwestern states in May, many records being broken on tributaries of the



Powered concrete ship of 4,400 long ton cargo capacity completes outfitting and gets final equipment installations at a Florida dock prior to entering the Caribbean trade.



...est concrete dam east of the Rocky Mountains, TVA's Fontana Dam on the Little Tennessee River had half of its ...,000 yd. of concrete in place at the end of the year. When completed, the dam will rise to 42 ft. above the high... trestle, or 460 ft. above the original stream bed.

...er Mississippi River. Fortunately the flood ...s did not synchronize to produce abnormal ...ds in the Mississippi itself.

...lood control operations of the U. S. Engineer ...artment largely marked time during the year, ...ough the War Production Board allowed work ...o ahead on projects that were nearing comple... Franklin Falls Dam at the headwaters of ...Merrimac River in New Hampshire was put into ...ice, as was Norfork Dam on the White River ...rkansas and Youghiogheny Dam on the river ...hat name above Pittsburgh. Work on Denison ... on the Red River in Texas and Oklahoma ...earing completion, as is work on John Martin ... on the Upper Arkansas River in Colorado. ...e Hollow Dam on a main tributary of the Cum...land River in Tennessee also was completed dur... the year.

...ter Supply and Sanitation

...THE FIELD OF WATER SUPPLY and sanitation ...ctice, the year past marked a period of adjust...t to war-created problems. This is not to imply ... everything went along smoothly or that every ...d was met. But existing services were main...ed at a comparatively high level, tremendous ...itions to physical facilities were completed to cope with specific war demands, and the philosophy of doing more with less—so far as materials and manpower are concerned—was wholeheartedly supported and applied. In fact, things progressed so well that it was possible to divert some attention to planning for future peacetime activities.

So far there have been no serious epidemics traceable to water-borne infections, but the city of Chicago has been greatly alarmed with the increased pollution of its Lake Michigan supply; it is reported that on occasions the coliform index of the raw water is more than three times greater than that considered permissible even for water that is to be subsequently filtered (Chicago has only facilities for chlorination at present). Armed with such evidence of need, Chicago was permitted by the WPB to resume construction of its 320 mgd. filtration plant, a project that is already about two years behind in its completion schedule because of the war.

In other places throughout the nation, where water was essential to industrial production, no efforts have been spared to speed the completion of necessary facilities. The record is rich with accomplishments in this direction, and at no time has war production been jeopardized by lack of water. Perhaps the most extensive of these war-inspired projects is that in the Hampton Roads

area of Virginia where long transmission mains, large interconnections and new storage and treatment facilities have been installed. Notable, too are the industrial supplies, some of which at ordnance plants employ groundwater installations delivering more than 50 mgd.

Industrial Waste Treatment

WAR INDUSTRIES with their great demand for water also discharge huge volumes of waste. And this has given rise to problems relating to stream pollution. Not the least of these was related to the disposal of TNT wastes, some of which are acid and others alkaline, but both of intense color. At first it was believed that extensive treatment by evaporation would be required to prevent despoilation of receiving waterways. Fortunately, it was determined that a regimen of dilution (1 to 10,000) would suffice to free the water from toxicity to fish life and humans; use of this method to render explosives manufacturing wastes innocuous is said to have saved millions of dollars that otherwise would have been needed for treatment installations.

All industrial waste treatment problems ca be solved in such a simple manner, however. treat distillery wastes adequately, for example, for the installation of rather elaborate facilities, material for which has not been available. A result, with distilleries completely converted making alcohol for war needs, the waste produ by this industry alone amounts to a popula equivalent of 28,000,000!

The necessary recourse to palliatives and p crastination, however, promises sooner or late give impetus to anti-pollution legislation, wh properly has been held in abeyance until mili victory is achieved. Congressional bills advanc the principle of federal participation in str cleanup measures are quietly being studied revamped, so that such legislation will be re for action early in the postwar period.

Army Waste Disposal

ONE PHASE OF DISPOSAL that has claimed ma attention is sewage treatment of army ca Design of these plants was greatly influenced

Heavy grading on the Alaska Highway along the Liard River in northern British Columbia, typical of one typ 1943 work that converted the 1942 trail road into a surfaced all-weather truck route.

hortage of critical materials, but despite cer- makeshifts they are functioning well under ings that in many cases have far outstripped nal estimates. One of the most troublesome ating problems has arisen from the presence rease in sewage; wider use of grease traps and asis on the salvage of fats at their point of n have resulted in the monthly recovery of six million pounds of grease at army camps. he army has also vigorously tackled the prob- of refuse disposal, and this has resulted in spread use of landfill methods. Cheap and nce-free disposal procedures were success- applied, and much land improvement has achieved at more than 100 camps where fills are now in use. Because the landfill m can be applied without the construction of ial facilities or the use of critical materials, lso found a wide field of usefulness in munici- ies where existing refuse disposal facilities have overtaxed by war population booms.

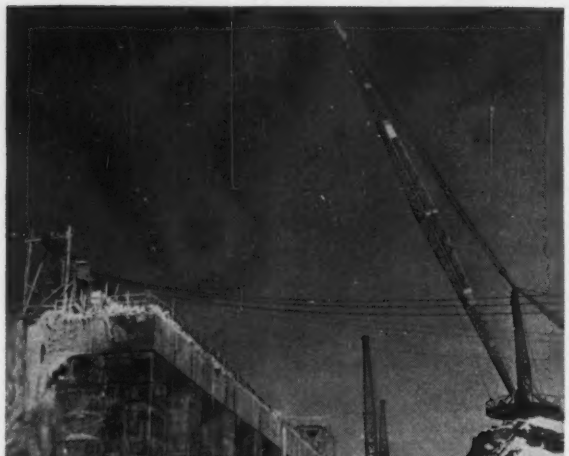
nsportation Meets a Challenge

NSPORT FACILITIES of all kinds—rail, highway, rway, air and pipeline—carried record loads 943, and evidence of the strain under which operated was supplied by several serious oad accidents, frequent breakdowns of buses trucks, and rush construction of pipelines. ite the fact that the railroads carried 14 per more freight and 60 percent more passengers 943 than in 1942, expenditures for new con- tion continued at about the low level of 1942, ugh maintenance expenditures necessarily to record heights. It was partly to relieve the oads, even if not necessarily in keeping with wishes, that oil pipeline construction continued e in 1943. Most spectacular job was the "Big " line (24-in. dia.) extending some 1,400 miles Longview, Tex., to the Philadelphia and New refinery districts, and later paralleled by a . line. And running these lines a close race ttention was the Canol oil project in Canada, of an Army-Congress controversy at the end e year. Canol is largely a pipeline job—some 0 miles of it—and one of the most difficult of nd ever built. From the oil field at Norman on the Mackenzie River, a pipeline to carry e oil is just being completed running 600 miles e southwest across mountains to Whitehorse, he Alcan Highway. A refinery transplanted Texas is being erected at Whitehorse, and

Laying some of the 1,700 miles of pipe for the Canol oil line in northwest Canada. The tractor crane is holding a pipe section while the welded joint is made. None of the pipe is buried.

gasoline pipelines have been extended 600 miles north and 400 miles south along the highway, serving several important airports along the main interior air route to Alaska. A stub pipeline from tidewater at Skagway to Whitehorse, 110 miles, has been in service for a year now supplying gas from tankers to that interior center. Pipelaying technique compatible with wild country conditions had to be developed. All joints are welded, and the entire pipeline lies on the surface except at stream crossings where subaqueous trenching was the rule. Controversial as it may be, Canol is a great construction job. In view of the world's dwindling oil supply, it someday may prove a great asset.

Waterway transport also enjoyed a busy year. On the Tennessee River, completion of Fort Loudoun Dam extended the commercially usable section of the stream up to Knoxville, 650 miles above the mouth. Considerable traffic moved along this waterway, and it may be expected to increase further when completion of Kentucky Dam in 1944 converts the lower section of the river from open channel to slack water. Largest waterway construction job of the year involved a third large lock in the St. Mary Canal at Sault Ste. Marie, Mich.



Headworks of the great Shipshaw power development on the Saguenay River in Quebec, built under severe winter conditions to supply more power for aluminum production.

Known as MacArthur Lock, it was built by the Army Engineers at record speed to insure against delays in vital ore and grain movement down the Great Lakes.

Highways Fall Farther Behind

HEAVY HAULING, lack of new construction, and shortages of men and materials for maintenance combined to bring the physical condition of our highway system to a new low in 1943. Since Pearl Harbor, new highway construction has been confined almost exclusively to access roads to war plants and military establishments, or to a few main highways on which serious congestion had developed due to war traffic. That work was largely brought to completion in 1943 without particularly raising the standards of the system as a whole. Moreover, maintenance problems greatly increased, following the virtual elimination of restrictions on truck loading brought about when the Office of Defense Transportation obtained special concessions for trucks moving in war service. This condition added to the immediate troubles of the state highway engineers, and it holds promise of future trouble when the politically powerful truck operators seek to make the heavier loadings permanent. Most current design standards could be made obsolete in that way, with a consequent reduction in the useful life of thousands of miles of pavement, and that just at a time when the highway departments will be busy making up for time lost during the war.

Alcan and Inter-American

IN SO FAR AS ACTUAL ROADBUILDING was concerned it was operations north and south of our border that commanded most attention. Up north, the year 1943 saw a vast amount of work done on the 1,800 mi. highway to Alaska, improving the trail road of 1942 into an all-weather route. When the spring thaws came, many miles of the early road, which had been kept open during cold weather, were lost, and many temporary bridges were swept away in the spring floods. The necessary construction task was thus obvious. Drainage and a good base came first, and then permanent bridges were built. Twenty percent of the line was relocated, eliminating 100 miles of distance, and the whole road was surfaced with a minimum of 12 in. of gravel for a width of 24 ft. About half of the permanent bridges were completed.

Controversies may boil over the present location of the road, or over the very need of it, but no amount of wrangling can ever take from the Army Engineers and their troops, the Public Roads Administration and the contractors involved, the glory of building the pioneer Alcan Highway route in one short arctic season and then rebuilding the road into a high class gravel-surfaced highway the second short season.

Work on the Inter-American Highway between the south border of Mexico and the Panama Canal followed another pattern. Under piecemeal construction for a good many years, its quick completion as a rough military road was sought when enemy submarines threatened the Caribbean shipping lanes. The Army Engineers pushed the work with all possible vigor, but late in 1943 withdrew their construction forces when the war situation improved. Up to the time work was suspended the Army had graded and surfaced 331 miles of road with gravel or crushed stone, and had cleared the right-of-way for 454 additional miles.

Guatemala is completing the all-weather road through its territory. Such a road has been completed in El Salvador, and travel across Honduras and Nicaragua will soon be possible in good weather. At the south end of the highway, an all-weather route is available from the Panama Canal almost to the Panama-Costa Rican border. No road of any kind exists across part of Costa Rica, where the road must climb to over two miles high.

he Public Roads Administration is continuing rogram, which includes construction of a dif- t 71-mile section in southern Costa Rica, and building of a number of bridges scattered ong several of the countries.

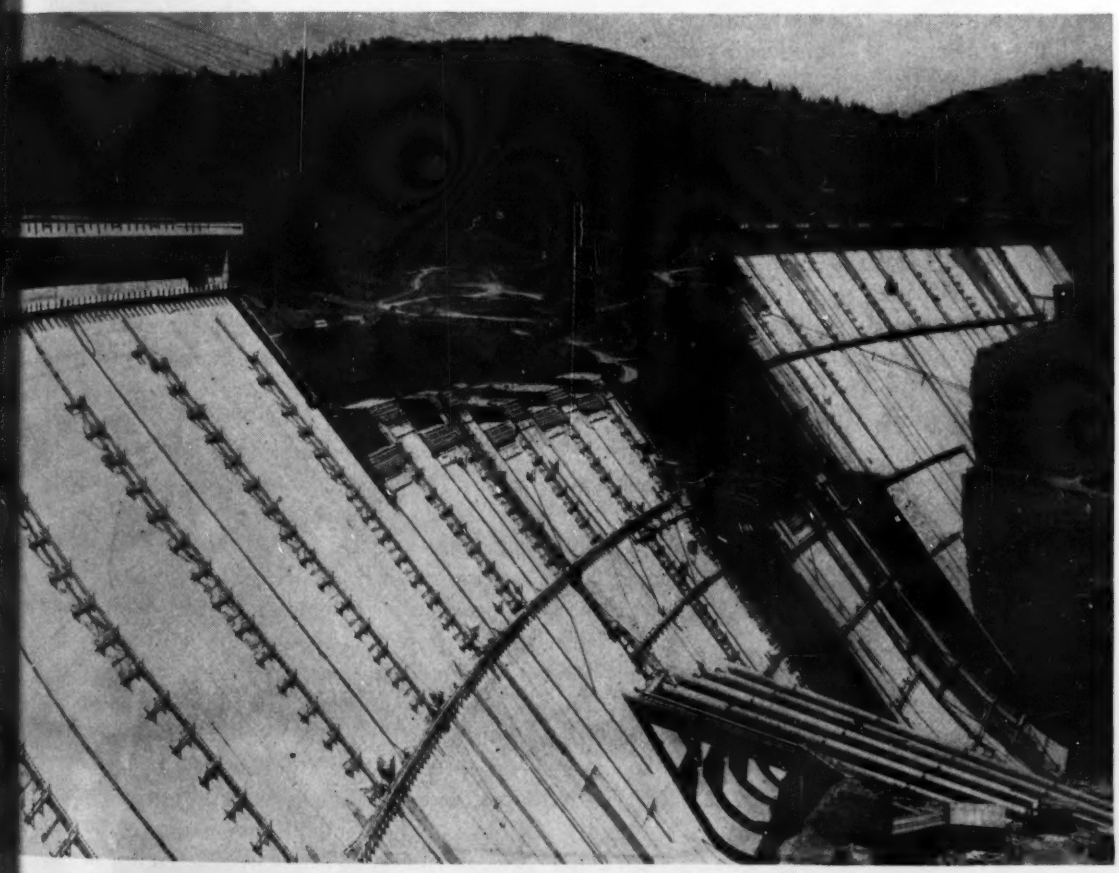
twar Highway Plans

THE MEANTIME, while building new roads out- the country and attempting to maintain old s at home, highway authorities are laying plans the expenditure of from $1,690,000,000 to 00,000,000 a year on new highway construc- in the years immediately following the war. upper figure would be twice the maximum t in any prewar year. Since much of this pro- d work will be badly needed, and as road- lding is looked upon as a quick employment ulant, much stress is being placed on the neces- for preparing plans, specifications and con- t drawings so that the work can rapidly be put er contract. To that end, Congress, about mid- , appropriated $50,000,000, to be matched by states on a 50-50 basis, for the preparation of plans; it also reallocated to the states the unexpended balances of previous federal-aid appropriations for a like purpose. There has been discussion of federal aid in the form of loans for rights-of-way acquisition, but no legislation had been introduced up to the end of the year.

Some states are well advanced with their postwar planning; others, due to shortage of staff, had made little progress up to the end of 1943, although now that the access roadwork is mostly out of the way their planning should be accelerated. In a few states, outside engineering firms have been engaged to do part of the design work. A notable example of this is a contract let late in the year for surveys and plans for the proposed Penn-Lincoln Parkway at Pittsburgh.

Postwar Air Transport

NOR IS THE HIGHWAY SEGMENT of the transportation field the only one with visions of an active future. Air transport is also planning for a bright postwar period. Applications for new routes continue to pile in on the Civil Aeronautics Board. Most



Dam on the Sacramento River, part of the Bureau of Reclamation's Central Valley power and water supply t in California, will be higher than Grand Coulee and more massive than Boulder. The first of its 6,200,000 cu. yd. ncrete was placed in July, 1940, and the last will be placed this year.

are from established airlines, but many come from steamship companies and a few from railroad subsidiaries. Projected routes extend as far afield as Bombay. Action on domestic lines awaits enactment of changes in domestic policy called for in legislation now in Congress, while action on foreign routes is not even that definite, dependent as it is on international developments.

The Civil Aeronautics Board estimates a five-fold increase in domestic airline operation by 1947, and an eight-fold increase in transoceanic travel. Recorded movements along the U. S. federal airways system rose from six million during 1942 to thirteen or fourteen million in 1943, being in large part military. By 1950, the board estimates that at least half a million private, commercial and military aircraft will be in active service in this country.

At present the United States has 3,000 classified airports. The Civil Aeronautics Administration estimates that to serve all cities of 10,000 population and over will require 460 additional airports, and to put every urban community within 50 miles of an airport would raise the number to 850. To build these airports and modernize existing ones will cost an estimated $250,000,000.

Airfield Construction

THIS DREAMING about future airports was, however, only a sideline to the main activity of 1943, which was the building of a considerable number of actual fields. The construction program was substantial, despite the fact that the War Production Board cut the Civil Aeronautics Administration's share drastically just as the year opened, later easing the restrictions somewhat. Most of the new work was enlargement of military fields or of fields serving airplane manufacturing plants. Also included was work at the several naval air stations along the seacoast, and the building of "flight strips" in the coastal areas, both for emergency and tactical use. Of special interest to engineers was the continued study of the design of runways to withstand the high wheel concentrations of the heavy planes now in service. Stemming from research on flexible pavements begun several years ago by the California Division of Highways, the work has been carried forward actively during 1943 by the Corps of Engineers.

It was abroad, however, that the real job of airfield construction in 1943 was carried out. Measured by number of fields, money involved, square yards of runway built or amount of construction equipment used, foreign operations completely eclipsed those at home. The work was divided between the Army Engineers and the Navy Seabees and it varied from emergency landing strips on Pacific atolls to great installations in the South Pacific and the Aleutians that rivaled the biggest in the United States. Millions of yards of steel landing mat were used on these fields. In England where dozens of airdomes for our bombers were built, concrete runways were characteristics, while in North Africa and the Middle East, sand-asphalt surfaces were the rule. There was hardly any type of airfield construction that some group of American construction men did not try in some part of the world.

American Engineers Abroad

BUILDING AIRFIELDS was, of course, only one of many construction activities that occupied Americans abroad during 1943. It could not be otherwise with our military operations as widespread as they are. But it was not only the construction men in uniform, but civilians as well, who took American practices abroad.

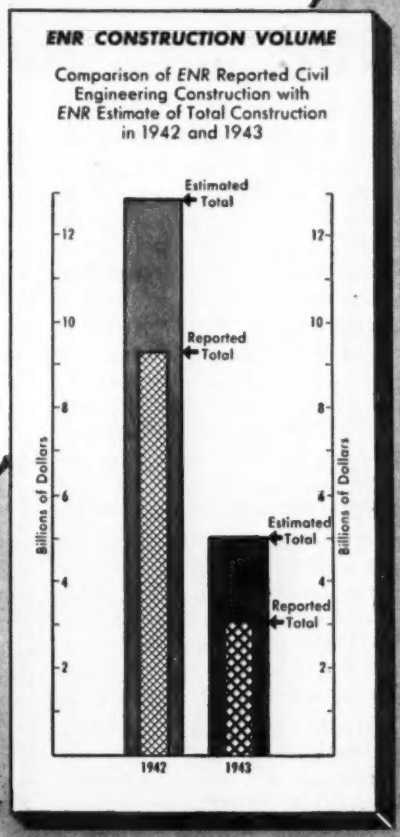
For example, in cooperation with all the countries in the southern hemisphere except Argentina, the United States undertook numerous projects relating to defense, production of strategic materials and the implementation of the Good Neighbor Policy. Hundreds of engineers and a score of contractors, were engaged last year in the construction of airports, highways, harbor works, railroads, industrial and mining facilities and sanitation projects, the latter including hospitals and health centers.

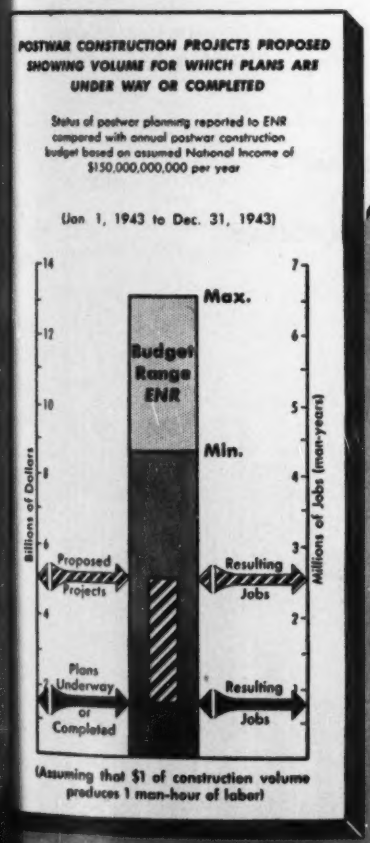
Credits extended by the U. S. Export-Import Bank have played the major role in financing this work, but the Army, too, made big investments in the development of airports. Sanitation activities are sponsored by the Office of the Coordinator of Inter-American Affairs, which with a Congressional appropriation of close to $50,000,000, has undertaken cooperative programs with eighteen of the Latin American countries.

As the year ended, huge American construction projects involving oil refineries and pipelines in the Middle East were entering the preliminary stages, and there was much talk of other operations in China, on the Pacific islands and elsewhere once the war is ended. Without doubt, American construction turned both its efforts and its eyes to foreign fields in 1943. The repercussions may well be felt for many years to come.

Construction Mops-Up War Program at Home

Estimated Total Volume
ENR Reported Total
Residential Building
New Capital
Employment and Materials
Construction Costs
Labor Rates
Material Prices




POSTWAR CONSTRUCTION PROJECTS PROPOSED SHOWING VOLUME FOR WHICH PLANS ARE UNDER WAY OR COMPLETED
Status of postwar planning reported to ENR compared with annual postwar construction budget based on assumed National Income of $150,000,000,000 per year
(Jan 1, 1943 to Dec. 31, 1943)
Max.
Budget Range ENR
Min.
Billions of Dollars
Millions of Jobs (man-years)
Proposed Projects
Resulting Jobs
Plans Underway or Completed
Resulting Jobs
(Assuming that $1 of construction volume produces 1 man-hour of labor)

Lays Groundwork for Postwar Jobs

Postwar Construction Budgets
Proposed Postwar Projects
Postwar Planned Volume
Distribution of Proposed Projects

Construction Mops-Up War Work at Home And Lays Groundwork for Postwar Jobs

THE SPECTACULAR ENGINEERING construction of 1943 was that accomplished by Army engineers and Navy construction battalions outside the United States. No statistics are available to measure it, but it consumed the capacity production of construction equipment manufacturers at two to three times their prewar rate, and in addition, a large proportion of the Corps of Engineers' equipment pool, plus acquisitions of used equipment.

Mopping-up operations on the war construction program at home totaled $5,000,000,000, the estimated total for all classes of construction which includes $3,061,844,000 for heavy engineering construction. The latter compares with a volume of $3,002,856,000 in 1939, the last strictly prewar year. The total estimated volume represents a drop of 61 percent from the war peak set in 1942.

The statistics this year require adjustments due to government policies not previously existing. Cancellations of war contracts affected the reported total volume for 1942, reducing it from $9,306,000,000 to $8,000,000,000. Such cancellations continued in uncertain amounts in 1943, while the situation was further complicated by secret construction whose volume it is not permissible to report. Adjustments of present recorded 1943 totals will therefore have to be made.

Federal estimated volume, $3,520,000,000, continued to dominate the construction total, accounting for 70 percent of the whole. Although this volume dropped 66 percent below 1942, and 34 percent under 1941, it exceeded all other annual totals on record. State and municipal estimated volume, $300,000,000, was down 38 percent. The public total, $3,820,000,000, declined 65 percent from 1942, but except for the war and defense years, 1940, 1941 and 1942, topped all other yearly volumes.

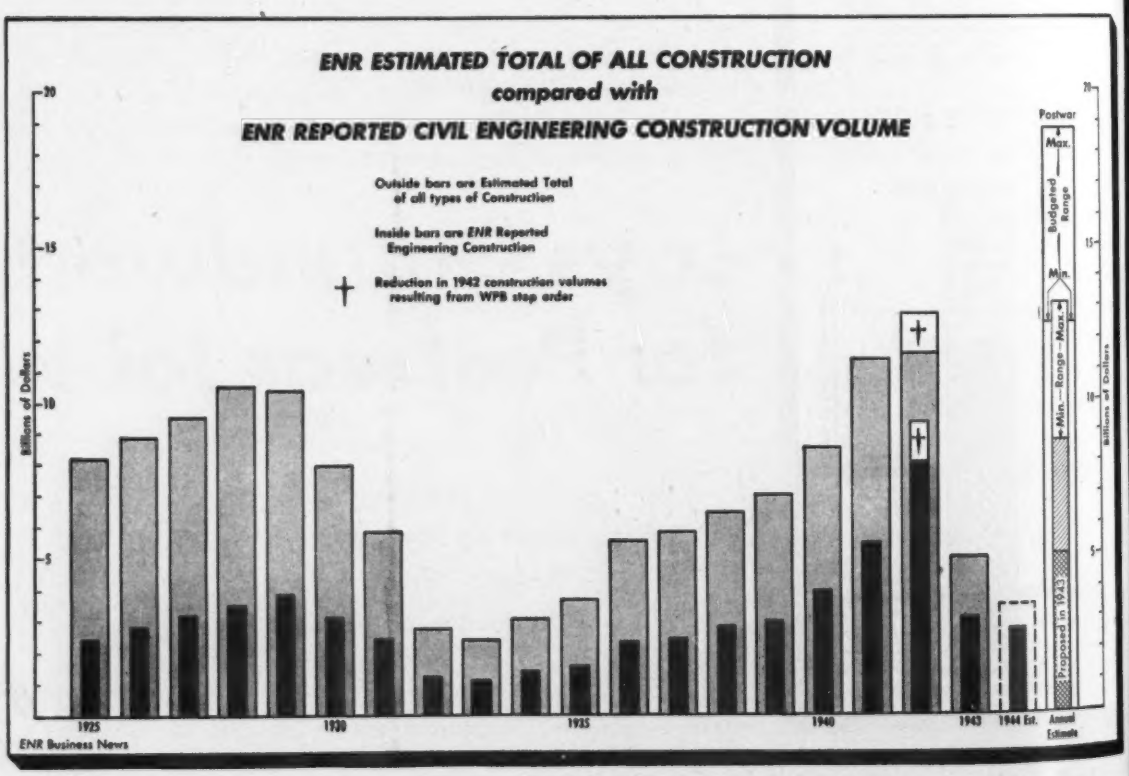
Private construction, $1,180,000,000, was 33 percent lower than in the preceding year as a result of the 15 percent decrease in private engineering work and the 50 percent decline in residential building.

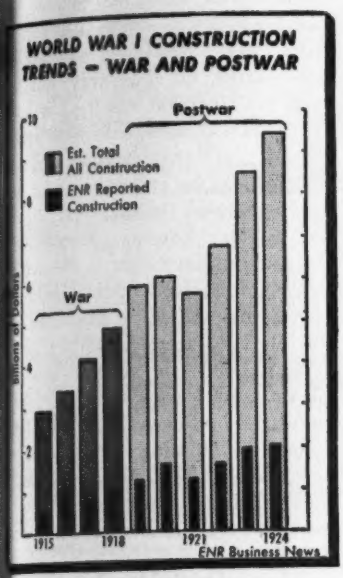
The 1944 outlook for construction within continental U. S. is for a 30 percent drop in the overall total, from $5,000,000,000 to $3,500,000,000; and a 10 percent decline in the *ENR* reported construction volume, from $3,061,844,000 to $2,750,000,000. Re-

I—ESTIMATED TOTAL CONSTRUCTION

(Millions of Dollars)

	Public	Private	Total	ENR Vol. Index
1925	2,476	5,702	8,178	201
1926	2,670	6,208	8,878	228
1927	3,073	6,522	9,595	263
1928	3,480	7,100	10,580	287
1929	3,263	7,114	10,377	317
1930	3,363	4,695	8,058	260
1931	3,098	2,832	5,930	220
1932	1,918	921	2,839	127
1933	1,533	907	2,440	102
1934	2,373	731	3,104	114
1935	2,460	1,221	3,680	134
1936	3,140	2,450	5,590	185
1937	2,806	3,046	5,852	172
1938	3,680	2,800	6,480	197
1939	3,750	3,224	6,974	211
1940	4,550	3,960	8,510	269
1941	7,200	4,196	11,396	375
1942	11,061	1,760	12,821	553
1943	3,820	1,180	5,000	176



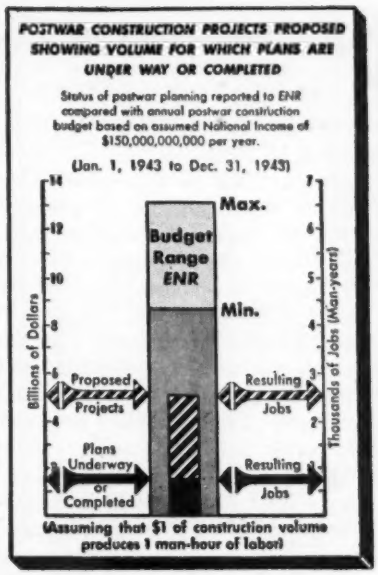


rictions on some construction equipment have been relaxed, and it is possible that when the results of the European invasion are conclusively successful, materials will be released gradually as they become available to enable the most needed work to go ahead.

Postwar construction outlook

Considering the potential imminence of the need for construction projects, planned and ready to go under contract, postwar engineering is not progressing as fast as could be desired. Out of $5,100,000,000 worth of proposed projects reported to *ENR* in 1943, only $1,647,960,000, had plans underway or completed.

Planned project volume is 19 percent of the minimum construction budget and 12½ percent of the maximum. The budget of annual civil engineering construction anticipated in the postwar period, based on an assumed national income of $150,000,000,000 per year, ranges from $8,700,000,000 to $13,100,000,000. Proposed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Resulting Jobs
(Assuming that $1 of construction volume produces 1 man-hour of labor)

projects reported during 1943 are 59 percent of one year's minimum budget, 39 percent of the maximum.

II—PROPOSED POSTWAR CONSTRUCTION PROJECTS—UNITED STATES AND CANADA, 1943

As Reported to Engineering News-Record (Thousands of Dollars)

States	PUBLIC WORKS CONTRACTS: Water-works	Sewer-age	Bridges	Earth-work	Streets and Roads	Build-ings	Un-classified	Federal Government Work	PRIVATE CONTRACTS: Bridges	Indus. Bldgs.	Com. Bldgs.	Un-classified	All Construction: Private	Public	Eng. Constr. Total	$ Per Capita (1940 Census)	States
Me.	.....	732	55	905	605	1,390	45	.....	.....	40	150	.....	190	3,732	3,922	4.6	Me.
N. H.	15	50	.....	.....	.....	1,213	50	150	.....	.....	.....	.....	.....	1,328	1,328	2.7	N. H.
Vt.	.....	145	.....	30,000	.....	675	.....	30,000	.....	.....	.....	.....	.....	30,820	30,820	86.0	Vt.
Mass.	3,924	325	715	13,555	1,300	10,496	8,513	13,500	.....	280	4,350	.....	4,630	38,828	43,458	10.1	Mass.
R. I.	105	643	25	131	150	9,936	3,829	74	.....	2,500	450	15	2,965	14,819	17,784	25.0	R. I.
Conn.	600	4,092	717	15,940	65,000	14,265	802	15,990	25	130	2,450	150	2,755	101,416	104,171	61.0	Conn.
New Eng.	4,644	5,987	1,512	60,531	67,055	37,975	13,239	59,714	25	2,950	7,400	165	10,540	190,943	201,483	23.9	New Eng.
N. Y.	6,328	94,847	105,633	43,597	97,623	323,786	128,717	42,796	.....	2,000	50,150	.....	52,150	800,531	852,681	63.3	N. Y.
N. J.	4,195	6,179	1,000	4,453	68,221	24,136	4,259	150	.....	40	150	475	665	112,443	113,108	27.2	N. J.
Pa.	8,320	60,830	21,757	95,015	99,556	10,836	26,146	95,000	.....	.....	212	.....	212	322,460	322,672	32.6	Pa.
Md.	7,725	7,000	.....	11,125	20,000	8,074	4,295	10,000	.....	100	500	.....	600	58,219	58,819	32.3	Md.
D. C.	.....	.....	.....	15	50	16,158	100	7,865	.....	.....	.....	.....	.....	16,323	16,323	24.6	D. C.
Del.	.....	.....	25	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	25	25	0.1	Del.
Mid. Atl.	26,568	168,856	128,415	154,205	285,450	382,990	163,517	155,811	.....	2,140	51,012	475	53,627	1,310,001	1,363,628	45.0	Mid. Atl.
Va.	1,312	3,463	20,937	.....	23,900	4,946	3,025	.....	.....	.....	.....	.....	.....	57,583	57,583	21.5	Va.
W. Va.	.....	.....	.....	19,500	.....	.....	.....	19,500	.....	.....	.....	.....	.....	19,500	19,500	10.3	W. Va.
N. C.	695	2,105	2,309	2,894	2,701	1,848	1,255	2,015	.....	.....	5,700	.....	5,700	13,807	19,507	5.5	N. C.
S. C.	14,960	.....	.....	3,127	600	.....	300	17,127	.....	400	.....	.....	400	18,987	19,387	10.2	S. C.
Ga.	14,000	.....	.....	3,250	.....	.....	.....	17,250	.....	.....	.....	.....	.....	17,250	17,250	5.5	Ga.
Fla.	1,954	19,263	8,461	33,225	9,949	16,562	14,396	32,825	.....	.....	1,000	.....	1,000	103,810	104,810	55.3	Fla.
Ala.	.....	.....	.....	63,375	.....	.....	.....	63,375	.....	.....	.....	.....	.....	63,375	63,375	22.4	Ala.
Miss.	.....	.....	13	3,375	.....	300	.....	3,375	.....	.....	.....	.....	.....	3,688	3,688	1.7	Miss.
La.	15	.....	500	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	515	515	0.2	La.
Ky.	.....	.....	.....	.....	.....	400	.....	.....	.....	.....	.....	.....	.....	400	400	0.1	Ky.
Tenn.	.....	18,656	.....	1,958	2,150	58,067	4,846	200	.....	40	1,200	.....	1,240	85,677	86,917	29.8	Tenn.
South.	32,936	43,487	32,220	130,704	39,300	82,123	23,822	155,667	.....	440	7,900	.....	8,340	384,592	392,932	13.9	South.
Ohio	11,881	56,812	88,428	23,456	110,824	86,905	67,346	19,600	.....	110	4,150	.....	4,260	445,352	449,612	65.0	Ohio
Ind.	245	11,721	14,161	17,840	20,555	22,983	8,372	150	.....	.....	2,300	2,075	4,375	103,877	108,252	31.6	Ind.
Ill.	273	1,977	25	19,000	3,997	5,600	282	19,000	.....	1,000	1,190	.....	2,190	31,154	33,344	4.2	Ill.
Wis.	530	6,875	7,670	97	3,585	15,576	7,393	33	.....	910	850	.....	1,760	41,726	43,486	13.6	Wis.
Mich.	21,080	15,386	58,375	.....	105,474	341,691	212,462	3,549	.....	.....	650	.....	650	754,468	755,118	143.7	Mich.
Mid. West	34,009	92,771	168,659	60,093	252,435	472,755	295,855	41,732	.....	2,020	9,140	2,075	13,235	1,376,577	1,389,812	52.2	Mid. West
Minn.	428	2,999	5,021	117	9,711	15,596	29,516	117	25	1,540	6,300	100	7,965	63,388	71,353	25.6	Minn.
Iowa	110	4,899	4,634	15,095	625	3,025	480	15,000	.....	210	588	75	873	28,868	29,741	11.7	Iowa
Mo.	15,396	8,692	17,496	37,550	77,804	52,717	27,903	57,500	.....	51,140	9,640	.....	60,780	237,558	298,338	78.9	Mo.
Ark.	140	80	20,371	915	1,044	3,793	5,050	15	.....	.....	500	.....	500	31,393	31,893	16.4	Ark.
N. D.	210	240	30	1,630	.....	200	420	.....	.....	.....	.....	.....	.....	2,730	2,730	4.3	N. D.
S. D.	1,425	744	80	232	.....	445	113	.....	.....	.....	400	.....	400	3,039	3,439	5.4	S. D.
Neb.	5,358	632	500	10,650	20,000	3,015	10,344	9,000	.....	40	250	.....	290	50,499	50,789	38.6	Neb.
Kan.	1,465	100	.....	9,000	.....	400	100	9,000	.....	.....	.....	300	300	11,065	11,365	6.3	Kan.
Okla.	1,975	.....	300	.....	.....	150	25,000	300	.....	.....	.....	.....	.....	27,425	27,425	11.8	Okla.
Tex.	23,750	10,653	18,195	155,580	106,600	14,535	24,145	128,718	50	4,914	35,675	2,000	42,639	353,458	396,097	61.8	Tex.
Mont.	.....	2,183	.....	.....	18,000	.....	.....	.....	.....	.....	.....	.....	.....	20,183	20,183	36.1	Mont.
Wyo.	45	200	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	245	245	1.0	Wyo.
Colo.	.....	.....	.....	.....	.....	.....	.....	.....	.....	1,500	300	.....	1,800	.....	1,800	1.6	Colo.
N. M.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	N. M.
W. of Miss.	50,302	31,422	66,627	230,769	233,784	93,876	123,071	219,650	75	59,344	53,653	2,475	115,547	829,451	945,398	35.4	W. of Miss.
Idaho	.....	.....	.....	15,100	.....	.....	.....	15,100	.....	.....	.....	.....	.....	15,100	15,100	28.8	Idaho
Utah	30	322	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	352	352	0.6	Utah
Ariz.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Ariz.
Nev.	.....	.....	.....	3,958	25,902	635	.....	.....	.....	.....	.....	.....	.....	30,495	30,495	277.5	Nev.
Wash.	17,579	8,480	18,764	16,868	81,954	7,786	3,853	16,310	.....	40	150	.....	190	155,284	155,474	89.6	Wash.
Ore.	55	10,360	300	66,833	1,235	2,421	.....	66,283	.....	.....	.....	25	25	81,204	81,229	74.6	Ore.
Calif.	71,231	26,514	3,609	2,150	269,783	56,348	24,949	.....	.....	.....	600	70,000	70,600	454,584	525,184	76.0	Calif.
Far West	88,895	45,676	22,673	104,909	378,874	67,190	28,802	97,693	.....	40	750	70,025	70,815	737,019	807,834	70.7	Far West
U. S. Total	237,354	388,199	420,106	741,211	1,256,898	1,136,909	648,306	730,267	100	66,934	129,855	75,215	272,104	4,828,983	5,101,087	38.8	U. S. Total
Canada	36,122	134,217	143,741	331,255	371,300	139,259	357,784	.....	.....	5,570	4,325	6,000	15,895	1,513,678	1,529,573	133.8	Canada

ENR-Reported Construction Declines

CIVIL ENGINEERING construction reported in continental U. S. totaled $3,061,844,000 an average of $58,882,000 for each of the 52 weeks of 1943. On the weekly average basis, this volume was 66 percent below the $9,305,829,000 reported to *ENR* for the 53 weeks of 1942. It decreased 48 and 23 percent, respectively, from the defense construction years, 1941 and 1940, but exceeded all other annual totals since 1930. Including unreportable projects in 1943, and adjusting 1942 for WPB work stoppage, decrease from 1942 to 1943 is 53 percent instead of the 66 percent recorded above.

The 1943 total does not include construction by military engineers abroad, American contracts outside the country, shipbuilding, and known but unreportable secret projects within continental U. S.

Federal projects accounted for $2,373,987,000, or 77.4 percent of the total, and were 71 percent lower than last year. State and municipal work, which combines with federal to make up the public total, dropped to $196,559,000, 61 percent under a year ago, the lowest annual figure ever reported.

Public construction, $2,570,546,000, was 70 percent under 1942, and fell below 1940 and 1941, but with these exceptions topped all other annual public construction totals. Private engineering volume was 10 percent lower than in 1942, declining from $555,823,000 to $491,298,000, the smallest total reported since 1935.

Geographical distribution

Geographically, all sections reported decreases in comparison with their respective 1942 totals. New England volume, $144,144,000, was down 69 percent; Middle Atlantic, $403,056,000, was 66 percent lower; South, $673,316,000, was off 64 percent; Middle West, $371,930,000, declined 76 percent; West of the Mississippi, $730,442,000, fell 70 percent; and Far West, $738,956,000, decreased 54 percent.

Far West and West of the Mississippi, though below their record volumes of 1941 and 1942, topped all other reported yearly totals.

In 1943, 24.1 percent of the engineering construction volume was in the Far West states; 23.8 percent in the West of Mississippi states; 22.0 percent in the Southern states; 13.2 percent in the Middle Atlantic states; 12.2 percent in the Middle West states; and 4.7 percent in New England. In the preceding year, West of Mississippi states led the nation with 26.5 percent of total reported volume.

Public buildings lower

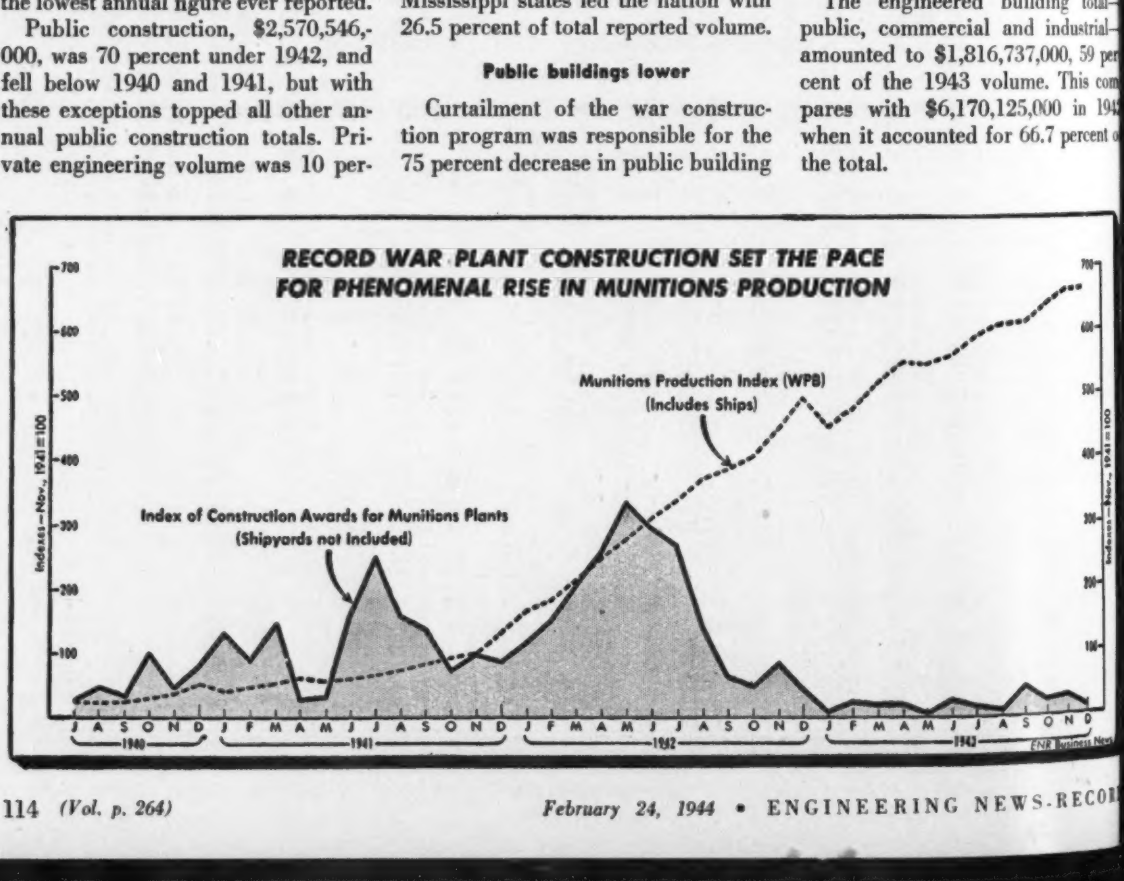
Curtailment of the war construction program was responsible for the 75 percent decrease in public building construction. The 1943 volume, $1,419,357,000, also declined 49 percent from 1941, but eclipsed all other annual marks. Of the public building total $440,098,000 was for war housing; $160,122,000 for federally-owned, privately-operated plants; $93,141,000 for federally-owned, federally-operated plants; $37,352,000 for military housing; $661,798,000 for other military buildings; and $26,846,000 for all other public buildings.

New manufacturing structures built during 1943 totaled $420,097,000—$253,263,000 in federally-financed plants, and $166,834,000 in private industrial buildings. This total of new industrial building was 83 percent below the $2,578,230,000 reported in 1942. Private plant volume was 15 percent lower, and federal was down 89 percent.

A monthly index of federal war plant construction since mid-1940 compared with the WPB Munitions Production Index shows that construction men provided war production facilities at an unprecedented rate and merit corresponding credit for speeding up the war effort.

Commercial building and large-scale private housing, $230,546,000, declined 19 percent from the preceding year. All except $1,862,000 of this total was mass housing construction.

The engineered building total—public, commercial and industrial—amounted to $1,816,737,000, 59 percent of the 1943 volume. This compares with $6,170,125,000 in 1942 when it accounted for 66.7 percent of the total.


RECORD WAR PLANT CONSTRUCTION SET THE PACE
FOR PHENOMENAL RISE IN MUNITIONS PRODUCTION
Munitions Production Index (WPB)
(Includes Ships)
Index of Construction Awards for Munitions Plants
(Shipyards not Included)
Indexes—Nov., 1941 = 100
700
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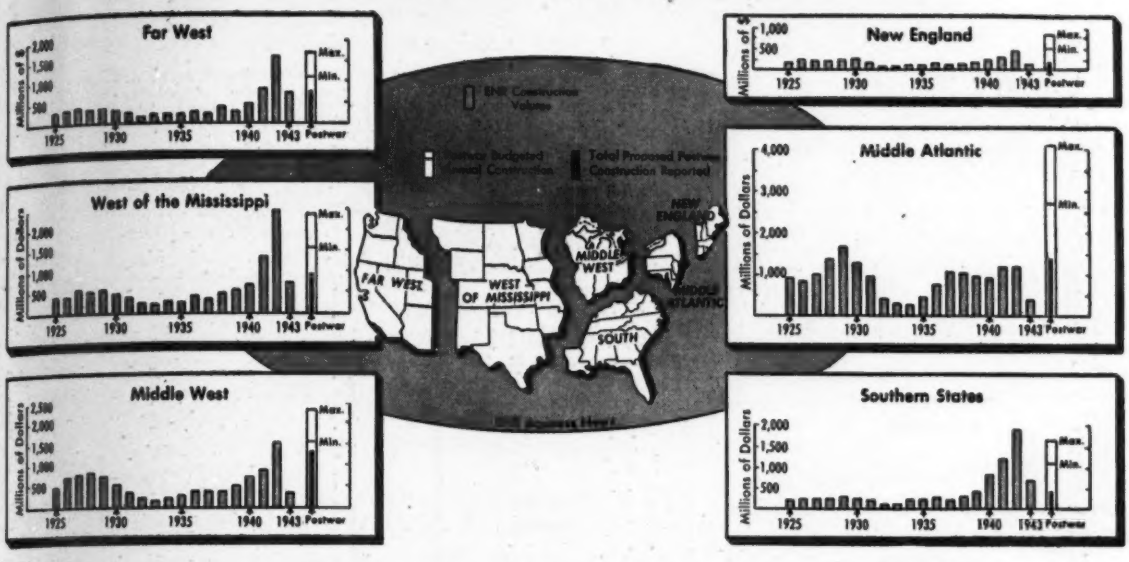
GEOGRAPHICAL DISTRIBUTION OF ENR-REPORTED CONSTRUCTION



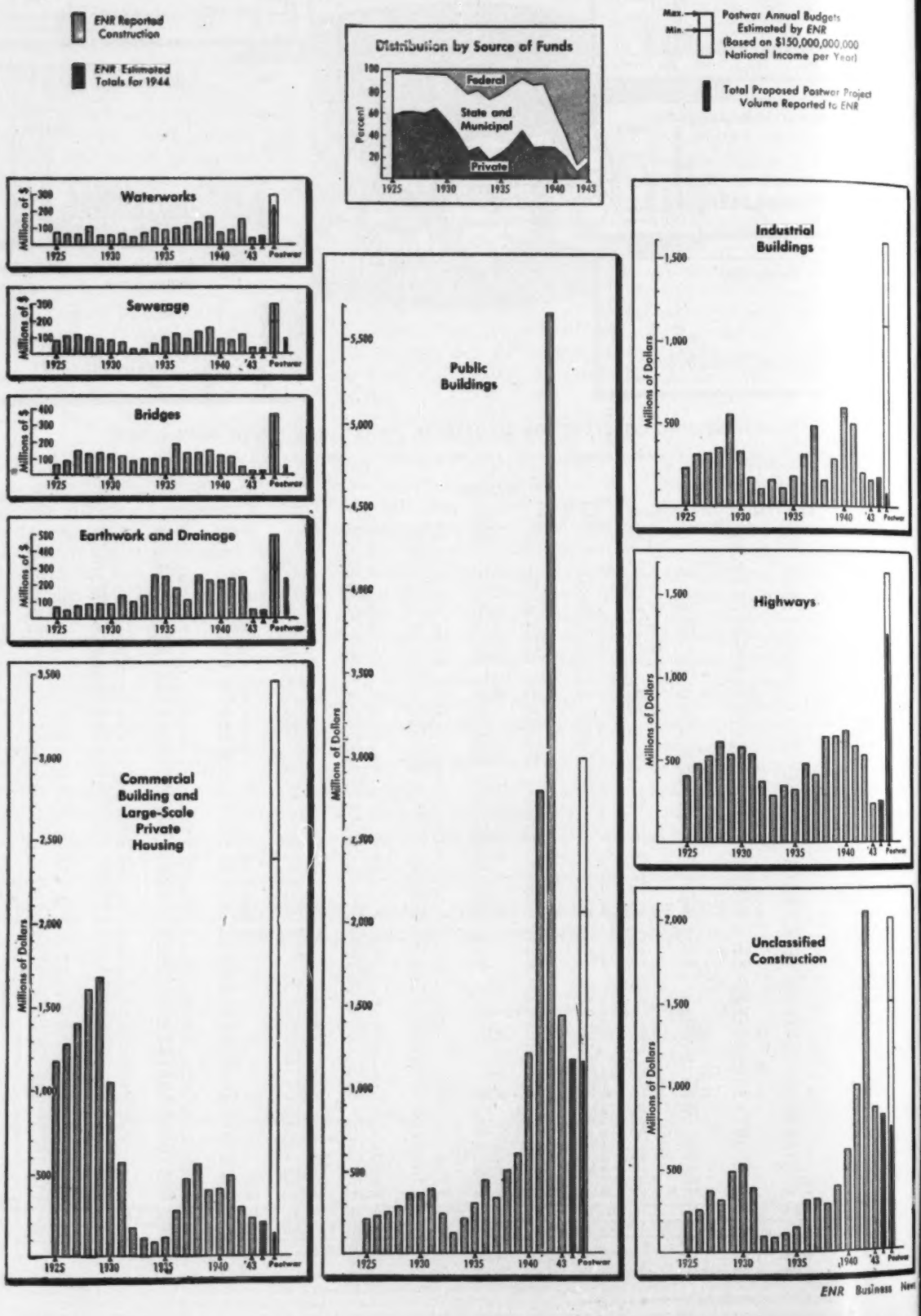
III—ENGINEERING CONSTRUCTION REPORTED IN 1943 BY ENGINEERING NEWS-RECORD

Minimum contracts reported: Waterworks, excavation, drainage and irrigation, $15,000; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000. (Thousands of Dollars 000 omitted)

States	Water-works	Sewer-age	Bridges	Earth-work	Streets and Roads	BUILDINGS Indus-trial	BUILDINGS Com-mercial	BUILDINGS Public	BUILDINGS Un-classified	Federal Gov't. Work	All Construction Private	All Construction Public	1943 Total† 52 Weeks	1942 Total‡ 53 Weeks	% Change 1942 to 1943*
Maine	173	160	22	393	318	185	3,830	13,320	11,536	25,767	4,120	25,817	29,937	38,392	−21
New Hampshire	184	39	.....	75	175	80	.....	1,786	1,119	3,291	80	3,348	3,428	11,233	−69
Vermont	.....	16	.....	.....	.....	.....	.....	1,116	530	1,662	.....	1,662	1,662	1,995	−15
Massachusetts	528	538	292	1,479	3,288	1,845	5,492	22,621	11,180	38,100	7,544	39,719	47,263	114,804	−58
Rhode Island	578	320	.....	302	879	397	2,076	7,148	1,990	10,968	2,498	11,192	13,690	172,525	−92
Connecticut	339	800	25	605	796	3,961	16,929	20,737	3,972	25,977	29,960	27,204	48,164	128,027	−62
New England	**1,772**	**1,873**	**339**	**2,854**	**5,456**	**6,468**	**28,327**	**66,728**	**30,327**	**105,765**	**35,202**	**108,942**	**144,144**	**466,976**	**−69**
New York	1,197	621	182	3,632	8,872	300	1,000	42,926	29,577	79,298	1,300	87,007	88,307	358,032	−65
New Jersey	735	2,396	555	1,511	3,975	6,973	14,170	47,743	33,627	86,450	22,472	89,213	111,685	223,546	−49
Pennsylvania	510	440	426	1,976	7,868	4,664	22,640	36,317	10,221	43,721	33,104	51,958	85,062	412,873	−79
Maryland	772	1,367	769	528	5,838	707	18,962	32,972	30,650	67,835	19,824	72,741	92,565	177,276	−47
District of Columbia	800	560	193	66	1,972	.....	.....	7,014	2,964	11,143	.....	13,569	13,569	39,165	−65
Delaware	99	60	.....	50	723	150	1,620	7,492	1,674	10,088	1,770	10,098	11,868	14,498	−17
Middle Atlantic	**4,113**	**5,444**	**2,125**	**7,763**	**29,248**	**12,794**	**58,392**	**174,464**	**108,713**	**298,535**	**78,470**	**324,586**	**403,056**	**1,225,390**	**−66**
Virginia	385	1,682	342	2,134	7,521	300	800	66,257	10,583	82,960	1,100	88,804	90,004	297,980	−69
West Virginia	125	132	293	.....	2,008	2,000	.....	2,467	15,611	3,332	17,151	5,485	22,636	27,658	−16
North Carolina	1,489	1,046	92	151	3,780	640	200	30,037	17,537	51,770	1,440	53,532	54,972	174,930	−68
South Carolina	582	215	.....	81	1,125	100	7,494	19,551	8,931	28,884	8,609	29,470	38,079	88,568	−56
Georgia	1,029	1,356	1,150	150	5,661	105	2,000	37,026	14,505	56,623	2,105	60,877	62,982	159,244	−60
Florida	8,237	2,277	653	2,632	13,835	.....	.....	61,643	91,366	174,669	25	180,618	180,643	362,366	−49
Alabama	1,663	131	303	40	4,282	2,200	1,798	33,770	8,640	45,176	3,998	48,829	52,827	188,699	−71
Mississippi	780	302	859	4,076	825	.....	552	18,116	5,380	28,884	1,307	29,583	30,890	123,067	−74
Louisiana	478	964	309	858	4,604	305	5,406	16,227	18,480	35,962	7,296	40,335	47,631	141,560	−66
Kentucky	298	392	498	.....	7,615	553	.....	6,059	5,148	11,367	553	20,010	20,563	76,790	−73
Tennessee	479	2,263	449	475	3,855	315	1,000	59,348	3,905	66,672	1,315	70,774	72,089	289,310	−75
Southern	**15,545**	**10,760**	**4,948**	**10,597**	**55,111**	**6,518**	**19,250**	**350,501**	**200,086**	**586,269**	**44,899**	**628,417**	**673,316**	**1,930,172**	**−64**
Ohio	1,137	1,077	620	631	20,070	15,637	15,341	58,424	29,675	87,733	36,237	106,375	142,612	353,395	−59
Indiana	410	592	313	300	7,475	5,437	650	37,823	28,214	64,543	6,824	74,390	81,214	334,688	−75
Illinois	2,203	835	959	1,543	14,313	15,120	1,937	25,514	8,422	36,536	18,432	52,414	70,846	523,514	−86
Wisconsin	262	337	190	103	1,410	5,316	900	8,426	1,990	12,709	6,776	12,158	18,934	104,862	−82
Michigan	1,525	2,837	5,512	15	8,085	1,466	500	31,885	6,499	39,233	1,966	56,358	58,324	271,463	−78
Middle West	**5,537**	**5,678**	**7,594**	**2,592**	**51,353**	**42,976**	**19,328**	**162,072**	**74,800**	**240,754**	**70,235**	**301,695**	**371,930**	**1,587,922**	**−76**
Minnesota	252	55	.....	14	1,089	4,740	.....	7,908	5,818	10,514	8,115	11,761	19,876	21,625	−6
Iowa	571	.....	87	345	2,626	925	575	8,048	5,669	13,279	2,342	16,514	18,856	73,311	−74
Missouri	316	766	1,991	460	1,214	1,460	330	14,786	7,264	18,591	8,190	20,397	28,587	184,048	−84
Arkansas	942	237	1,060	4,848	1,904	40	450	13,488	6,588	27,471	540	29,017	29,557	148,796	−80
North Dakota	.....	.....	.....	80	710	.....	.....	265	1,543	1,672	157	2,441	2,598	4,913	−46
South Dakota	79	100	.....	156	512	40	150	3,774	3,790	7,724	190	8,411	8,601	54,532	−84
Nebraska	181	395	74	1,231	4,823	865	324	48,470	24,831	77,219	1,189	80,005	81,194	227,548	−64
Kansas	184	161	32	176	3,589	124	640	36,036	20,335	58,187	764	60,513	61,277	238,667	−74
Oklahoma	560	748	1,266	2,472	6,113	40	.....	20,838	28,558	57,249	115	60,480	60,595	220,897	−72
Texas	9,499	5,523	3,344	3,472	18,236	14,167	37,894	115,398	146,053	249,033	94,963	258,423	353,386	1,076,381	−66
Moptana	443	100	.....	87	562	1,450	.....	2,342	5,132	7,226	2,660	7,456	10,116	23,452	−56
Wyoming	.....	.....	80	.....	596	500	.....	7,281	2,273	9,554	500	10,230	10,730	21,717	−50
Colorado	108	1,059	.....	2,191	1,999	40	.....	6,610	3,168	13,710	85	15,090	15,175	105,269	−85
New Mexico	204	257	173	.....	3,269	.....	.....	10,857	14,934	28,560	25	29,669	29,694	65,774	−54
West of Miss	**13,339**	**9,491**	**8,107**	**15,532**	**47,252**	**24,391**	**40,363**	**296,101**	**275,956**	**579,989**	**119,835**	**610,607**	**730,442**	**2,466,930**	**−70**
Idaho	123	50	129	125	2,857	.....	334	10,085	7,047	18,602	350	20,391	20,750	63,145	−67
Utah	280	207	161	503	3,069	285	2,710	19,650	3,319	24,144	3,090	27,094	30,184	125,273	−75
Arizona	264	365	.....	529	2,384	.....	1,000	10,894	9,901	23,308	1,100	24,237	25,337	120,537	−79
Nevada	65	92	39	.....	1,532	240	1,140	9,982	3,488	14,180	1,585	15,073	16,578	69,859	−76
Washington	2,094	1,377	890	2,548	9,764	1,350	6,760	86,553	35,401	129,977	8,994	137,743	146,737	312,003	−52
Oregon	313	712	147	547	3,852	410	4,610	23,327	10,417	35,802	5,301	39,034	44,335	121,587	−63
California	2,610	4,824	1,321	3,790	15,308	71,402	48,332	209,000	98,448	316,662	122,308	332,727	455,035	816,035	−43
Far West	**5,749**	**7,627**	**2,687**	**8,042**	**38,766**	**73,687**	**64,886**	**369,491**	**168,021**	**562,675**	**142,657**	**596,299**	**738,956**	**1,628,439**	**−54**
U.S. 1943	46,955	40,783	25,800	47,380	227,186	166,834	230,546	1,419,357	857,903	2,373,987	491,298	2,570,546	3,061,844†	.....	.....
U.S. 1942	150,965	118,437	50,158	251,328	530,504	280,319	291,703	5,678,103	2,034,312	8,241,058	555,823	8,750,000	.....	9,305,829‡	.....
% Change '43/'42*	−69	−65	−48	−81	−56	−15	−19	−75	−57	−71	−10	−70	.....	.....	−66
Canada '43	2,310	3,106	1,115	813	20,756	18,472	4,987	28,716	38,730	.....	25,629	93,376	119,005	.....	.....
Canada '42	4,244	3,630	1,570	1,501	24,150	43,922	3,528	80,370	62,233	.....	48,818	176,330	.....	225,148	−46

*Adjusted for difference in number of weeks. ‡Volume of construction stopped by WPB order estimated at $1,300,000,000, not deducted from this recorded total of work started in 1942.
†Known but unreportable secret projects not included in 1943 total.

ENR REPORTED CONSTRUCTION VOLUME BY CLASS OF WORK



Unclassified construction, $857,903,000, was the third highest ever reported, exceeded only by the totals for 1941 and 1942. This total, 57 percent under 1942, included $761,753,000 in federal projects; $89,037,000 in private; and $7,113,000 in state and municipal.

Waterworks and sewerage volumes were 69 and 65 percent lower, respectively, than in 1942. Federal projects accounted for 83 percent of the $46,055,000 waterworks total; and 75 percent of the $40,783,000 reported for sewerage.

Highways, bridges, and earthwork and drainage reported all-time low volumes. Highways, $227,186,000, were down 56 percent from last year; Bridges, $25,800,000, declined 48 percent; and earthwork and drainage, $47,380,000 decreased 81 percent.

Residential Building

Building permit dollar volume for 257 identical cities was estimated at $750,000,000 according to preliminary reports from the Bureau of Labor Statistics. Of the total $310,000,000 was for residential construction, $280,000,000 for non-residential work and $160,000,000 for alterations to existing structures.

Construction of 350,900 new dwelling units was started in non-farm areas in U. S. according to preliminary figures by the Bureau of Labor Statistics. This number of units was 29 percent below the 496,600 for 1942, and 51 percent under the 715,000 units in 1941.

One-family dwelling units, 287,448, were 25 percent below last year; two-family units, 17,766, were down 11 percent; and multi-family units, 45,686, declined 49 percent.

Publicly-financed war housing units totaled 167,149 and were 48 percent of the 1943 volume. They declined 14 percent from the 195,400 publicly-financed units in 1942. Privately-financed units, 183,751, were 39 percent below last year. All geographical sections of the country and all city-

IV—CONTRACTS FOR INDUSTRIAL BUILDING CONSTRUCTION BY INDUSTRIES

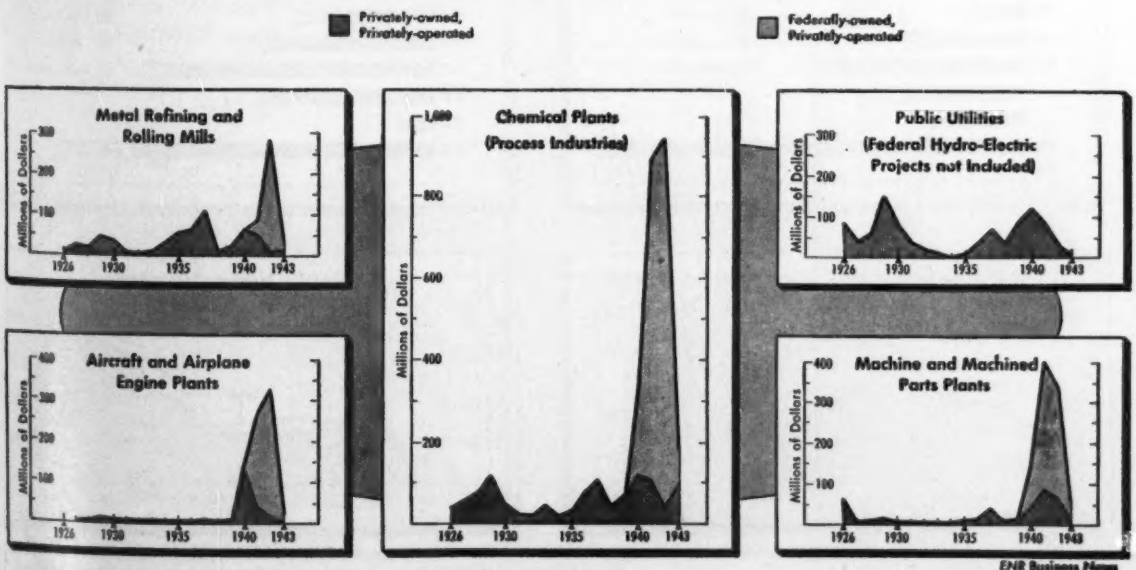
(Federally-owned privately-operated plants added to private construction 1940-43)

(Value in Thousands of Dollars ENR Reports)

	1939	1940			1941			1942			1943		
	Pvt. Own.	Pvt. Own.	Fed. Own.	Total	Pvt. Own.	Fed. Own.	Total	Pvt. Own.	Fed. Own.	Total	Pvt. Own.	Fed. Own.	Total
Transportation Service													
1. Railroads	$1,447	$1,827	.....	$1,827	$2,965	.....	$2,965	$2,473	.....	$2,473	$3,180	.....	$3,180
2. Automotive	4,114	5,077	.....	5,077	9,202	.....	9,202	1,733	.....	1,733	1,029	.....	1,029
Public Utilities	94,822	121,155	.....	121,155	86,180	.....	86,180	29,225	.....	29,225	6,555	$300	6,855
Process Industries (a)	78,239	123,165	$211,637	334,802	115,539	$777,034	892,573	42,263	$902,206	944,469	104,024	82,201	186,225
Food Industries (b)	23,049	28,292	.....	28,292	34,263	.....	34,263	9,544	500	10,044	9,134	.....	9,134
Metal Refining and Rolling	22,340	66,390	.....	66,390	52,636	39,171	91,807	9,217	272,325	281,542	13,875	11,409	25,284
Metal Working Plants													
1. Auto Factories	1,562	5,535	.....	5,535	2,980	.....	2,980	530	.....	530	210	200	410
2. Aircraft Factories	11,037	137,656	16,925	154,581	40,977	235,796	276,773	16,687	314,688	331,375	1,406	20,045	21,451
3. Foundries	1,819	2,050	.....	2,050	2,235	.....	2,235	6,629	22,991	29,620	1,368	3,360	4,728
4. Mach. and Mach. Parts	14,343	48,446	103,862	152,308	92,210	310,347	402,557	62,338	272,349	334,687	16,631	42,312	58,943
Radio	.....	.....	2,370	2,370	1,755	1,325	3,080	2,300	1,000	3,300	498	40	538
Textiles (Excluding rayon)	3,714	1,931	.....	1,931	9,148	.....	9,148	366	.....	366	320	.....	320
Wood Industries	950	2,890	.....	2,890	2,672	.....	2,672	700	.....	700	1,049	.....	1,049
Miscellaneous													
1. General Factories	24,744	49,065	.....	49,065	42,634	.....	42,634	15,729	123	15,852	6,825	255	7,080
2. Refrigeration and Cold Storage	800	585	.....	585	780	.....	780	585	.....	585	730	.....	730
Total	$282,980	$594,064	$334,794	$929,858	$496,176	$1,363,673	$1,859,849	$200,319	$1,786,182	$1,986,501	$166,834	$160,122	$326,956

(a) Includes distilleries. (b) Includes breweries and wineries.

PLANT EXPANSION IN PRINCIPAL WAR INDUSTRIES



size groups reported a lower number of units as compared with their respective totals for a year ago. Valuation of the units provided in 1943, $880,000,000, was 43 percent below the $1,539,000,000 estimated for 1942.

Preliminary estimates predict 225,000 new dwelling units for 1944. The indicated decrease, 35 percent, is attributed to publicly-financed units as private work is expected to remain at 1943 levels.

FHA mortgages selected for appraisal in 1943, $898,299,000 were 27 percent lower than a year ago. Almost 70 percent of the mortgage total, $622,000,000, was for war housing, a figure that compares with $727,000,000 in 1942 when it made up 59 percent of the year's volume.

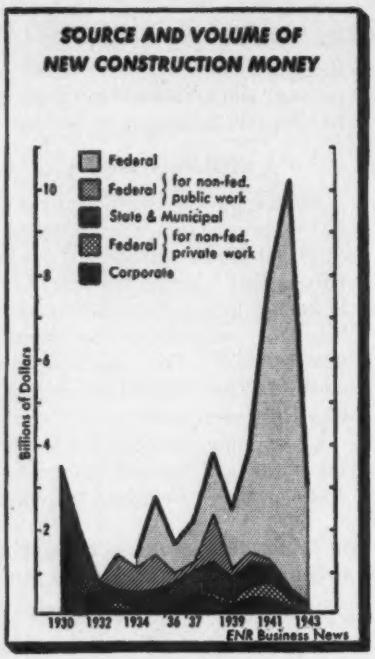
Residential building costs climbed 4.1 percent in the first eleven months of 1943 as reported by the Federal Home Loan Bank Board. This index of building costs for a standard six-room frame house reported material costs 4.4 percent higher, and labor costs up 3.6 percent.

The residential building cost index average for the eleven-month 1943 period, 126.9, rose 3.0 percent above the 1942 annual average and 11.3 percent over that reported for 1941.

New Capital

New capital for construction purposes totaled $3,073,080,000 in 1943, 69 percent below the record high of $10,219,318,000 reported for the 53 weeks of 1942. Federal appropriations for federally-owned construction made up 90 percent of the year's total, and the balance was almost equally divided between private investment and federal financing of non-federal work.

The 1943 new construction financing includes $22,431,000 in corporate security issues; $130,633,000 in state and municipal bond sales; $15,045,000 in RFC loans for public and private improvements; $3,133,000 in FPHA loans; $20,000,000 in REA loans; $128,000,000 in federal-aid for state highways; and $2,753,838,000 in federal appropriations for war and departmental construction.



V—NEW CONSTRUCTION CAPITAL

(Millions of Dlloars)

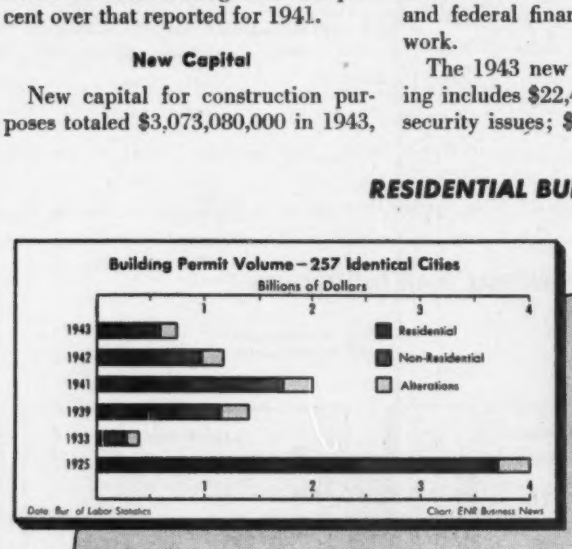
	Corporate	State and Municipal	Federal	Total
1925	$1,966	$1,352	.....	$3,318
1926	1,824	1,344	.....	3,168
1927	1,784	1,475	.....	3,259
1928	1,568	1,379	.....	2,947
1929	1,758	1,418	.....	3,176
1930	2,032	1,434	.....	3,466
1931	787	1,235	.....	2,022
1932	159	561	.....	720
1933	292	1,091‡	.....	1,383
1934	77†	1,011‡	194	1,282
1935	47†	1,337‡	1,354	2,738
1936	251	698‡	691	1,640
1937	518†	738‡	946	2,202
1938	457†	1,902‡	1,345	3,704
1939	304†	783‡	1,318	2,405
1940	624†	805‡	2,466	3,895
1941	741†	477‡	6,677	7,895
1942	332†	225‡	9,662	10,219
1943	56†	135‡	2,882	3,073

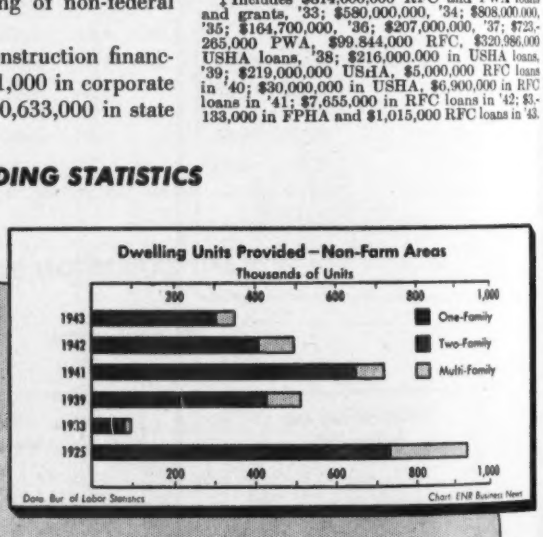
Note:—Federal appropriations include federal-aid highway, WPA, and regular departmental appropriations for construction.

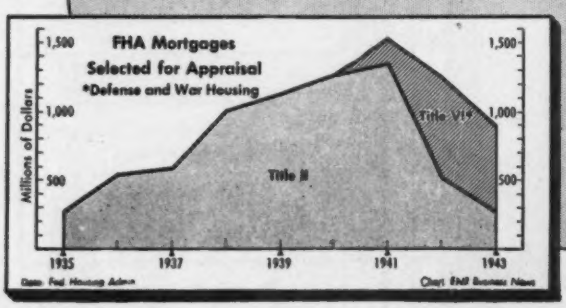
† Includes $237,000,000 RFC and PWA loans '33; $55,000,000, '34;$9,000,000, '35; $807,000, '37; $76,106,000 REA, $4,500,000 RFC loans, '38; $89,000,000 REA and $400,000 RFC loans, '39; $40,000,000 REA and $193,000,000 in RFC loans '40; $100,500,000 in REA and $282,000,000 in RFC loans in '41; $149,800,000 in RFC in '42; $20,000,000 in REA and $14,030,000 in RFC in '43.

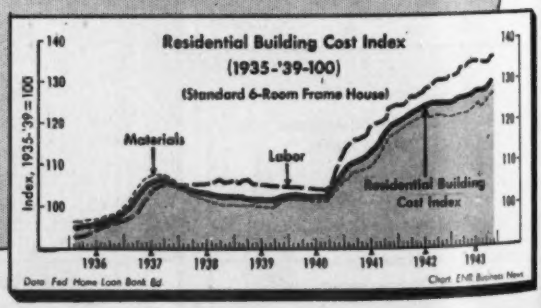
‡ Includes $814,000,000 RFC and PWA loans and grants, '33; $580,000,000, '34; $808,000,000, '35; $164,700,000, '36; $207,000,000, '37; $723,265,000 PWA, $99,844,000 RFC, $320,986,000 USHA loans, '38; $216,000,000 in USHA loans, '39; $219,000,000 USHA, $5,000,000 RFC loans in '40; $30,000,000 in USHA, $6,900,000 in RFC loans in '41; $7,655,000 in RFC loans in '42; $3,133,000 in FPHA and $1,015,000 RFC loans in '43.

RESIDENTIAL BUILDING STATISTICS









Employment and Materials

CONSTRUCTION EMPLOYMENT estimates averaged 1,757,000 workers per month in 1943, a decrease of 33 per cent from the 2,619,000 men reported as the average for 1942 according to the National Industrial Conference Board. These estimates are based on contract construction employment at the project site, and do not include force account workers, WPA construction laborers, or workers engaged in off-the-site prefabrication.

The January estimate, 2,210,000 men, was the highest for 1943. The employment estimate decreased steadily throughout the year until in December it was 1,315,000 men.

Federal and state highway construction employment, hit hard by material and manpower shortages, and reduced revenues, averaged 46,593 workers per month during the first eleven months of 1943, and was 34 percent lower than the average monthly employment reported in 1942 by FWA.

Construction employment estimates, in reporting decreases, ran counter to the trend of overall employment estimates. The total labor force average for 1943, 62,068,000 workers, was 11 percent above the 55,767,000 workers reported for 1942.

Postwar planned project volume reported to *ENR* during 1943 is expected to produce 823,980 jobs for construction men in the postwar years, assuming that one dollar of construction volume produces one man-hour of labor and that construction labor works 2,000 hours per year. Proposed postwar project volume, on the same basis, would produce 2,550,000 jobs if it all matures into planned projects.

Material Shipments

Shipments of fabricated structural steel for bridge and building construction totaled 831,836 tons in 1943, 50 percent below the 1,677,653 tons reported in 1942 by the American Institute of Steel Construction. Steel ingot production, 88,872,598 net tons, broke all existing records, topping the record set in 1942 by 3.2 percent. Though raw steel production, as reported by the American Iron and Steel Institute, reached this new peak, demands made by munitions and shipbuilding caused less steel to be allocated to the construction industry.

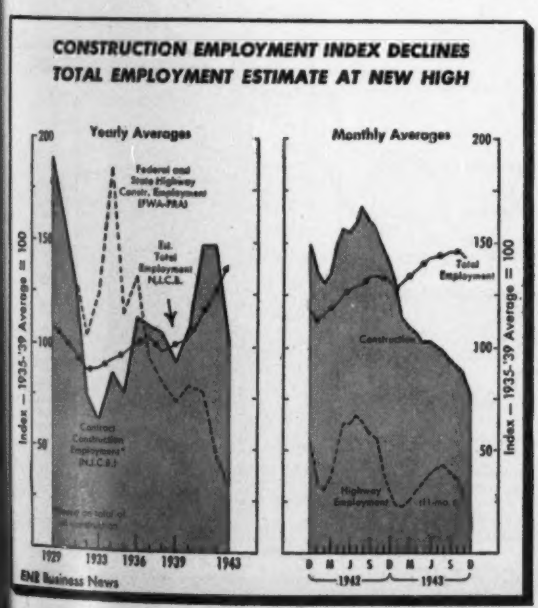
Portland cement shipments for the year totaled 127,567,000 barrels, 31 percent lower than last year. This shipment volume was also below the defense year totals of 1940 and 1941, but topped all other annual totals reported by the Bureau of Mines since 1930.

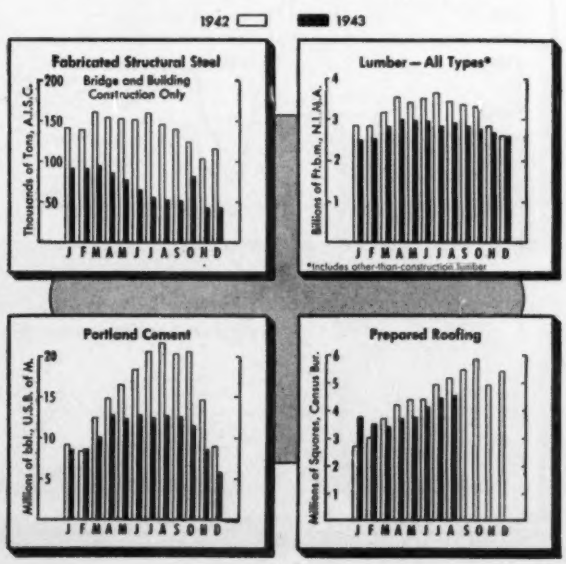
Lumber shipments totaled 33,686 million board feet during the year, a volume that was 13 percent below last year, and 1 percent under 1941, but higher than any other annual total reported by the National Lumber Manufacturers Association since 1929. Distribution of lumber by use has undergone extensive changes during the war period. In 1941, civilian and military construction bought 74 percent of the nation's lumber, wood-working factories took 11 percent, and boxing and crating, 15 percent. For 1944, however, construction has been alloted only 44 per cent; wood-working factories 12 percent; and boxing and crating, 47 percent.

VI—OUTPUT OF VARIOUS CONSTRUCTION MATERIALS FOR TEN-YEAR PERIOD

Item	Basis	Unit	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943*	% Change '42 to '43
Lumber	Shipments	Millions Bd. Ft.	15,353	19,628	24,283	24,988	22,201	25,811	30,095	34,086	38,946	33,686	−13.0
Cement	Shipments	Thous. Bbl.	75,901	75,239	112,850	113,805	106,324	122,651	130,350	167,508	185,267†	127,567†	−31.0
Cement	Production	% Capacity	29.6	29.3	44.1	45.5	41.2	47.7†	51.2†	65.3†	74.0†	54.0†	−27.0
Steel Ingots	Production	Thous. Net Tons.	28,671	37,428	52,425	55,443	31,071	51,585	66,982	82,837	86,030	88,873	+3.2
Steel Ingots	Production	% Capacity	37.4	48.7	68.4	72.4	39.7	64.7	82.1	97.3	96.8	98.1	+1.3
Fabricated Structural Steel	Shipments	Thous. Tons	1,034	1,095	1,548	1,661	1,159	1,440	1,516	2,251	2,040	‡	.....
Fabr. Str. Steel—Bridge & Bldg.	Shipments	Thous. Tons	.....	.....	.....	.....	.....	.....	.....	.....	1,678	832	−50.0
Explosives	Shipments	Thous. lb.	307,380	297,730	378,361	387,805	320,259	372,470	406,671	460,075	427,744	440,100	+3.0

* Preliminary totals. † Includes Puerto Rico. ‡ A.I.S.C. estimated shipment data for entire industry discontinued.




CONSTRUCTION MATERIAL SHIPMENTS LOWER
1942
1943
Fabricated Structural Steel
Bridge and Building Construction Only
Thousands of Tons, A.I.S.C.
Lumber — All Types*
Billions of Fb.m., N.L.M.A.
*Includes other-than-construction lumber
Portland Cement
Millions of bbl., U.S.B. of M.
Prepared Roofing
Millions of Squares, Census Bur.
J F M A M J J A S O N D

Construction Costs Climbed in '43

CONSTRUCTION COSTS continued their gradual rise in 1943, topping their former high average of 1942 by 4.9 percent according to the *ENR* Construction Cost Index. This measure of material and labor cost factors began 1943 at 283.45 and recorded increases in every month but July. In the final 1943 month the index value was 294.51, up 3.9 percent from the figure at the beginning of the year.

Lumber and common labor components again were the factors responsible for the rise as steel and cement were unchanged throughout 1943. Lumber rose almost steadily during the year, with only minor decreases reported in March and July, and as a result, was 7.0 percent higher in December than at the beginning of 1943.

The common labor factor of the index increased 4.5 percent in the twelve-month period, reporting rises in March, April, May and August.

The *ENR* Building Cost Index 1943 average, 228.75, also hit a new high, and gained 2.9 percent over the previous mark set in 1942. This index differs from the *ENR* Construction Cost Index in that the skilled labor component is substituted for common labor. It began the year at 226.87, and except for a minor drop in March, climbed gradually to 231.49 in December, a rise of 2.0 percent.

Building costs as measured by other general building cost indexes also reported gains in 1943, but differed from *ENR*-reported cost trends in the size of the increase. The American Appraisal Co. Index was 4.1 percent above its 1942 average; Associated General Contractors Index was 3.4 percent higher; and the E. H. Boeckh Co. Index for brick and concrete factory building construction in New York City climbed 1.5 percent.

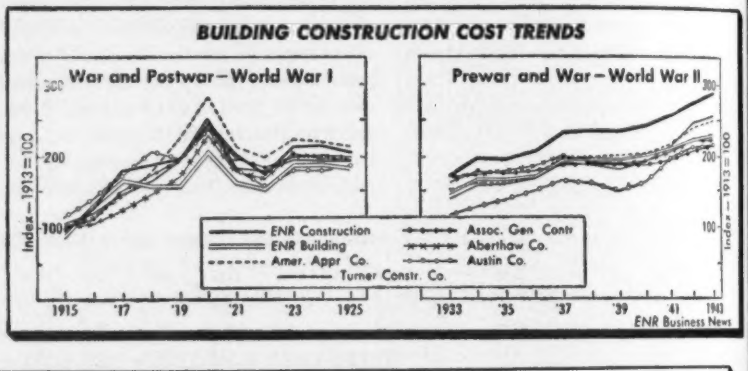
Contractor's cost indexes, which take management and labor efficiency cost factors into consideration as well as labor and materials, also topped their 1942 averages. The Austin Co. Index for 1943, 215, and the Aberthaw Co. Index, 225, were each 0.9 percent higher than their respective 1942 averages. The 1943 Turner Construction Co. Index, 257 (10-month average), and the George A. Fuller Co. Index, 238, were 4.9 and 3.9 percent higher, in that order.

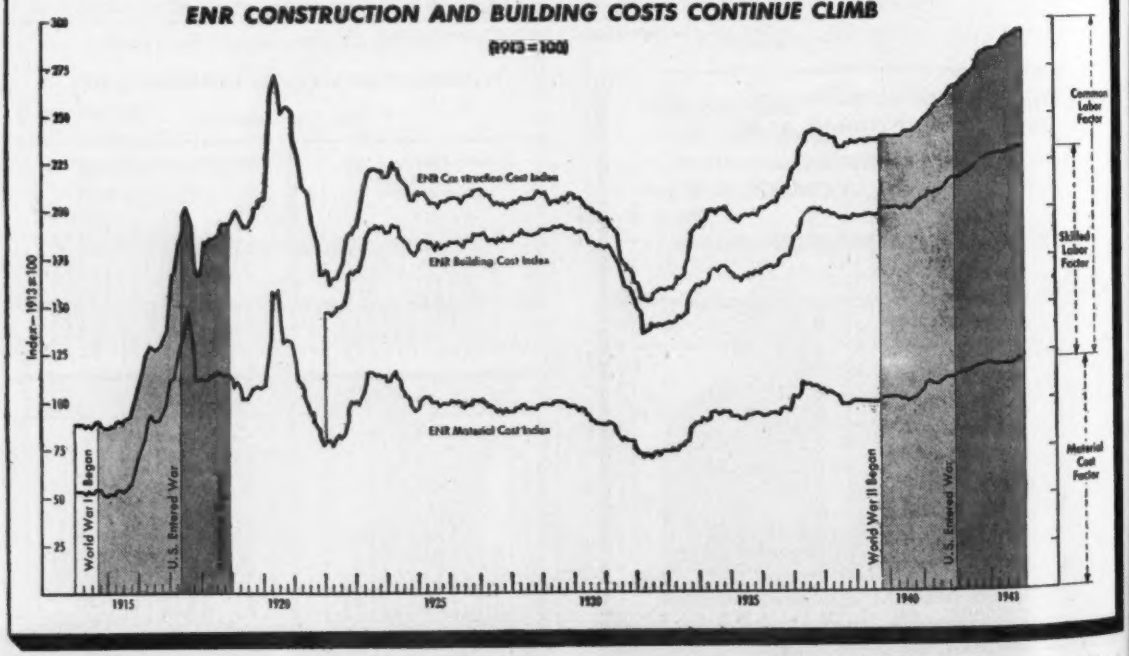
Common labor hourly rates for construction workers averaged 85.8c. in

VII—CONSTRUCTION AND BUILDING COST INDEXES (1913 = 100)

	1929 Aver.	1942 Aver.	1943 Aver.	Dec 1943
GENERAL INDEXES				
E N R Construction	207	276	290	295
E N R Building	191	222	229	231
Assoc. Gen. Contractors (Bldg.)	203	209	216	219
American Appraisal Co. (Bldg.)	217	241	251	256
E. H. Boeckh (Brick and Concrete Bldg., New York)	242	260	264	274
CONTRACTORS' INDEXES				
Aberthaw Co. (Bldg.)†	190	223	225	221
Turner Constr. Co. (Bldg.)	185	245	257*	263‡
Austin Company (Bldg.)	170	213	215	220
Geo. A. Fuller Co. (Bldg.)	201	229	238	240

†1914–100. *Ten-month average. ‡October, 1943.





3, a new all-time high, and 6.7 ent above the 1942 *ENR* 20-cities' rage rate. This average rate opened year at 83.2c. and by August had ched 86.9c., where it remained for balance of the year.

The skilled construction hourly rate rage for the twenty cities was 606 in January, 1943; climbed to 622 in August and September; and settled to $1.620 in October re it remained in November and ember. The December value was percent above that reported for uary, 1943. The 1943 average, 615, rose 3.3 percent over 1942.

The 1943 common and skilled rly rates in 26 manufacturing in-tries continued to climb at a ter rate than those reported for struction. The hourly rate for nufacturing common labor, based 10-month statistics, increased 10.0 cent over a year ago; and skilled or was 10.5 percent higher accord-to the National Industrial Confer-e Board.

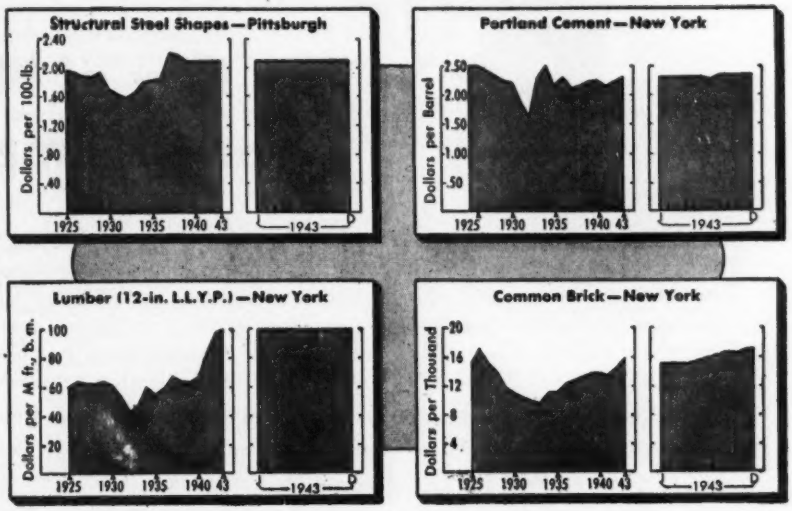
Real income for skilled construction kers, that is, hourly rates adjusted increased living costs, declined for second successive year. Although led construction workers' average rly rate increased 3.3 percent over 1942 average, living costs rose 5.6 cent, offsetting the skilled workers' gain. The common labor average, wever, rose 6.7 percent, at a faster e than the Cost of Living Index.

Material Prices

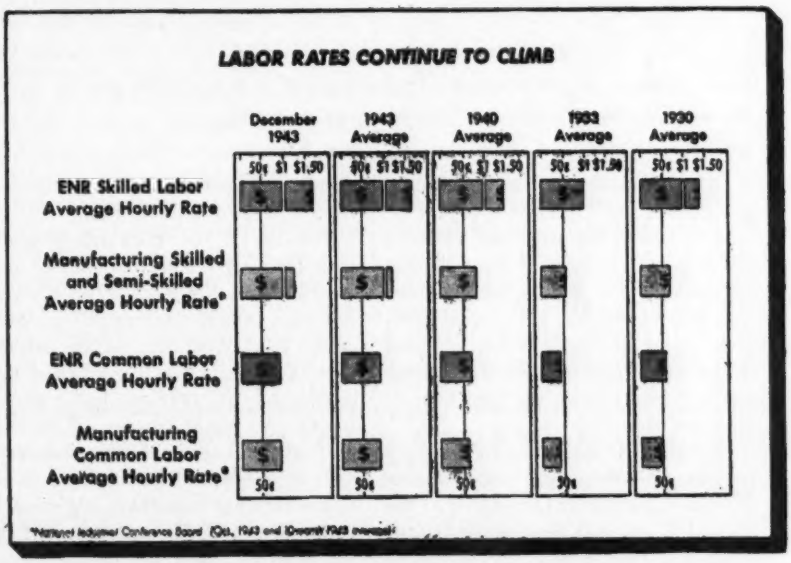
Construction material price aver-s were generally higher in 1943, ugh structural steel shapes and cast pipe prices remained unchanged n their 1942 averages. Portland ent price, not including cost of s, averaged $2.27 in New York , up 3.2 percent compared with 1942 average. Long-leaf yellow timbers were up 2 percent above year in New York. The twenty-s' average price for 2x4-in. pine, 93 per M ft., b.m., rose 6 percent a year ago, and 2x4-in. Douglas $51.84, was 5 percent higher.

Common brick price average in York City was $15.88 for 1943, increase of 12 percent over the 17 average reported for the pre-ng year. Lime prices were un-nged from last year. Cast iron pipe price, $49.00 per ton; and struc-l steel shapes, $2.10 per 100-lb., ained at their 1942 price levels.

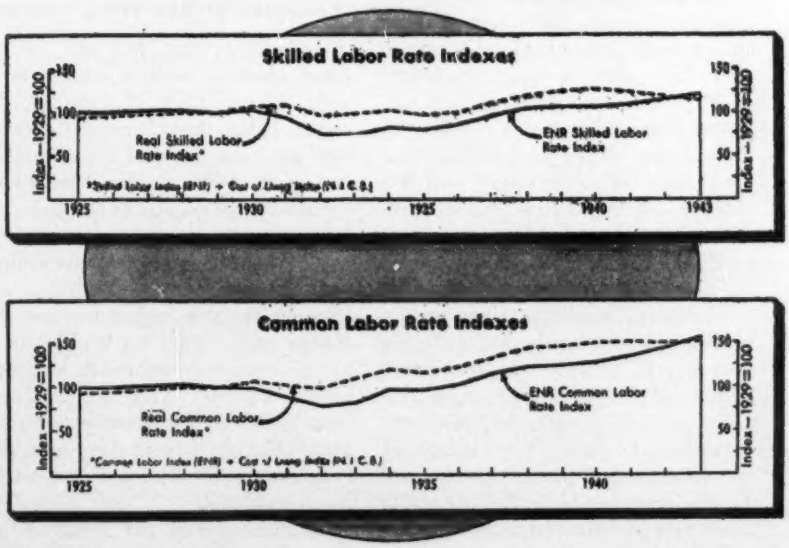
CONSTRUCTION MATERIAL PRICE TRENDS

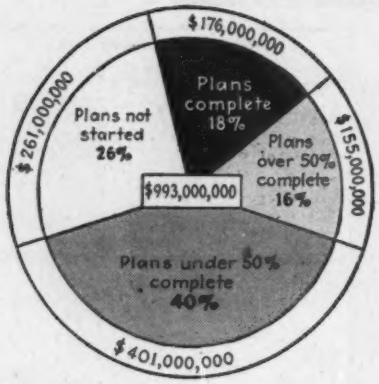


LABOR RATES CONTINUE TO CLIMB



REAL CONSTRUCTION WAGES DECLINE AS LIVING COSTS RISE





The City of New York Plan For the Impact of Peace

Irving V. A. Huie
Commissioner, Department of Public Works
Member, City Planning Commission
New York, N. Y.

***Contents in Brief**—Post war public works planning began in New York City before Pearl Harbor. And it was realistic planning, whose sole objective was to have the project shelf full of blueprints and specifications ready to use immediately hostilities ceased, or sooner if conditions so dictated. As a result, New York City has a program of useful, needed projects that will cost nearly one billion dollars definitely outlined. Designing is underway on three-quarters of this program, 18 per cent of it is complete and an additional 16 percent is over half complete, as shown above.*

THE OLD ADAGE, "In times of peace prepare for war" must be applied conversely and with equal force while we are at war contemplating the problems of peace. For the program to offset the impact which will come with peace must be ready before the end of the war. There can be no breathing spell. There will be no time then to stop and plan.

Industry has awakened to this very serious problem, and organizations like the Chamber of Commerce of the United States and the Committee for Economic Development are providing effective leadership. Industry must carry the principal load, but public works, although their cost will be only a small part of the total program, will also play a very important part. There have been various estimates of what this part might be. Fifteen percent of the total postwar program may be public works, with the balance of eighty-five percent provided by business and industry.

More important, however, there will be a period immediately following the cessation of hostilities when public works must be ready to carry the entire load. The first six to eighteen months of peace will be the most critical period of unemployment and, with public works ready, the burdens of this most critical period can not only be alleviated but controlled. It is this time that private enterprise will require as a breather for readjustment from a war to a peace basis.

The City of New York will be ready with contract documents, plans, and specifications for postwar work when the time comes. Having 5.7 percent of the total population of the nation, New York City has contributed approximately 700,000 men to the armed forces. An equal number of its citizens are engaged in war industry. This certainly indicates that its share of the national problem is big enough to require the full cooperation of its business, its industry, and its government.

Conception of New York's Program

As early as Sept. 13, 1941, before Pearl Harbor, with visionary foresight, Mayor F. H. LaGuardia, directed "That the Planning Commission give very careful consideration and study for a Public Works and Construction Program to be ready immediately after the ending of the present World War and the state of unlimited emergency now existing . . . consider for this budget preliminary studies, engineering and architectural plans for projects and public works to be constructed." Thus was initiated New York City's postwar works program. The city is now planning while it fights, and its plans are fast reaching completion.

The creation of the 1942 capital budget by the City Planning Com sion followed the directive of Mayor, and provided, in additio the construction monies, approxim ly $8,200,000 for definite archi tural and engineering plans for nite future public works. By spring of 1942 it was apparent construction work could not pro on projects previously approved. capital budget was then amende eliminate $30,000,000 of funds th tofore allocated to land and struction cost and, at the same t to increase funds for planning $13,400,000, which made a tota $21,600,000 allocated for plan definite projects having a total mated cost of $628,000,000.

A billion dollars of projects

This authorized the start of a postwar planning. The capital bud for the years 1943 and 1944 expa the program, ultimately provi $32,500,000 in planning monies projects having an estimated co $993,624,830.

New York City's postwar works gram has been carefully planned conceived. Only practical and rea projects are included. Measured the requirements of the comm the program is a moderate one. W future anticipation is given some sideration, in the main the prog reflects actual cumulative needs. is made apparent by the large num of projects that will merely rep old facilities. Such projects repre a long delayed effort to deal with growing problem of depreciation obsolescence of the city's pla plant, ordinary depreciation requ a yearly expenditure of $20,000

While some of the older sectio the city show demands for rep ment of impaired facilities, the

shift to new areas has increased demand for new facilities in excess of normal requirements parallelling normal growth of population. advantage is being taken to ide for coordinated planning in lection of sites, physical layouts, onizing architectural treatment, al relationship of improvements avoidance of duplication of ces.

hough the program covers a wide ty of projects from a $100,000 h sub-station to arterial improvements costing millions, it can safely id that no projects contemplated e described as either superfluous essential. There is no claim, however, that the program will constitute e of all the evils of New York even for the immediate future. e accompanying table shows the rtmental allocations of the program as of January 1, 1944. From it e derived an idea of the functional breakdown, as well as the wide e of the works which it encom-s.

ere is more to a postwar plan- program than setting up projects ppropriating planning funds. It ential, if the program is to succeed to progress beyond a discussion road generalities and to proceed cific detailed planning of specific cts. New York City has done The progress chart (opposite) in-s the Jan. 1, 1944 status of the am tabulated on this page.

blic Works Department's part

e Boards of Education, Higher ation, Transportation and Water y, and the Departments of Parks, ne and Aviation, and Water Sup-Gas & Electricity, each has charge sign and construction of projects r its respective jurisdiction. The gh Presidents have jurisdiction design and construction of ar- highways, street pavements, lo- nd storm sewers, in their respec- boroughs. All these are in addi- to the projects under the jurisdic- of the Department of Public s, which fall into three cate-s:

ings	$140,000,000
es	16,000,000
ge treatment works	87,000,000

e Department of Public Works policy of maintaining a bal- design organization, so that, ally, it is in a position to carry on the work under its jurisdiction. But its postwar design task, encompassing what would normally be a five to ten year program, is far beyond the capacity of this design force to handle within the time available. Accordingly, the design of a portion of the program has been assigned to private architects and engineers.

With a few exceptions, the Department of Public Works has jurisdiction over the design and construction of all buildings, structures and public works paid for from the city's treasury. The department designs, constructs, maintains, and operates the city's sewage treatment plants, the bridges over navigable streams, and municipal buildings, borough halls, and court houses. On behalf of other city departments, known as client or sponsoring departments, the Department of Public Works designs and constructs hospitals, health stations, correctional institutions, fire houses, police stations, sanitation buildings, welfare stations, markets, and warehouses. When construction is completed these structures are turned over to the client department for operation.

The design forces serve the client departments not only during actual design of projects, but during the period of assembling capital budget requests in preparation of basic data as to construction needs, anticipated costs, etc. For this purpose, a supervising architect is assigned to each major client department, it being his duty to become intimately familiar with the continuing needs of such department and to coordinate in detail the execution of the required design and construction program, either through departmental personnel or through the services of private architects and engineers retained for individual projects.

As indicative of the scope and character of the postwar program being handled by the Department of Public Works, both on its own behalf and on behalf of its client departments, some of the individual projects might be cited.

Sewage treatment works

Sewage disposal ranks high in the program due to the recognized need for removing pollution from water surrounding the city. There are twelve separate items in the program, which calls for the construction and extension of seven plants, providing additional capacity of some 700 mgd. The money value for the program is about $87,000,000, and with its completion the city will have accomplished about 85 percent of its objective of treating all the sewage of the city.

NEW YORK CITY'S POSTWAR PUBLIC WORKS PROGRAM

DEPARTMENT	TOTAL ESTIMATED COST	LAND COST	CONSTRUCTION COST
†Chief Medical Examiner	$ 500,000	.....	$ 500,000
†Correction, Department of	7,690,000	.....	7,690,000
Education, Board of	118,619,258	$26,622,396	91,996,862
†Fire Department	5,523,930	221,000	5,302,930
†Health, Department of	5,065,500	322,500	4,743,000
Higher Education, Board of	7,313,826	.....	7,313,826
†Hospitals, Department of	103,115,100	2,500,000	100,615,100
†Brooklyn Public Library	2,355,000	210,000	2,145,000
†New York Public Library	1,628,500	295,000	1,333,500
†Queensborough Public Library	1,407,000	159,000	1,248,000
Marine & Aviation, Department of	71,939,500	931,500	71,008,000
†Markets, Department of	1,970,000	97,500	1,872,500
Museums and Institutions	18,565,720	.....	18,565,720
Parks, Department of	76,871,235	.....	76,871,235
†Police Department	2,100,000	133,030	1,967,170
President, Borough of The Bronx	68,400,306	17,775,000	50,625,306
President, Borough of Brooklyn	48,761,150	10,112,450	38,648,700
President, Borough of Manhattan	65,540,769	15,607,100	49,933,669
President, Borough of Queens	63,100,986	7,030,172	56,070,814
President, Borough of Richmond	14,246,800	1,578,000	12,668,800
Public Works, Department of—			
Buildings	11,932,750	50,000	11,882,750
Bridges	15,850,000	947,000	14,903,000
Sewage Disposal	86,475,000	1,351,000	85,124,000
†Purchase, Department of	620,000	.....	620,000
†Sanitation, Department of	8,749,300	235,000	8,514,300
Transportation, Board of	69,303,000	2,474,000	66,829,000
Water Supply, Board of	105,000,000	.....	105,000,000
Water Supply, Gas & Electricity, Department of	10,380,000	.....	10,380,000
†Welfare, Department of	600,000	70,000	530,000
Total	$993,624,830	$88,721,648	*$904,903,182

* Includes engineering, construction, furniture and equipment.
† Denotes client departments of the Department of Public Works.

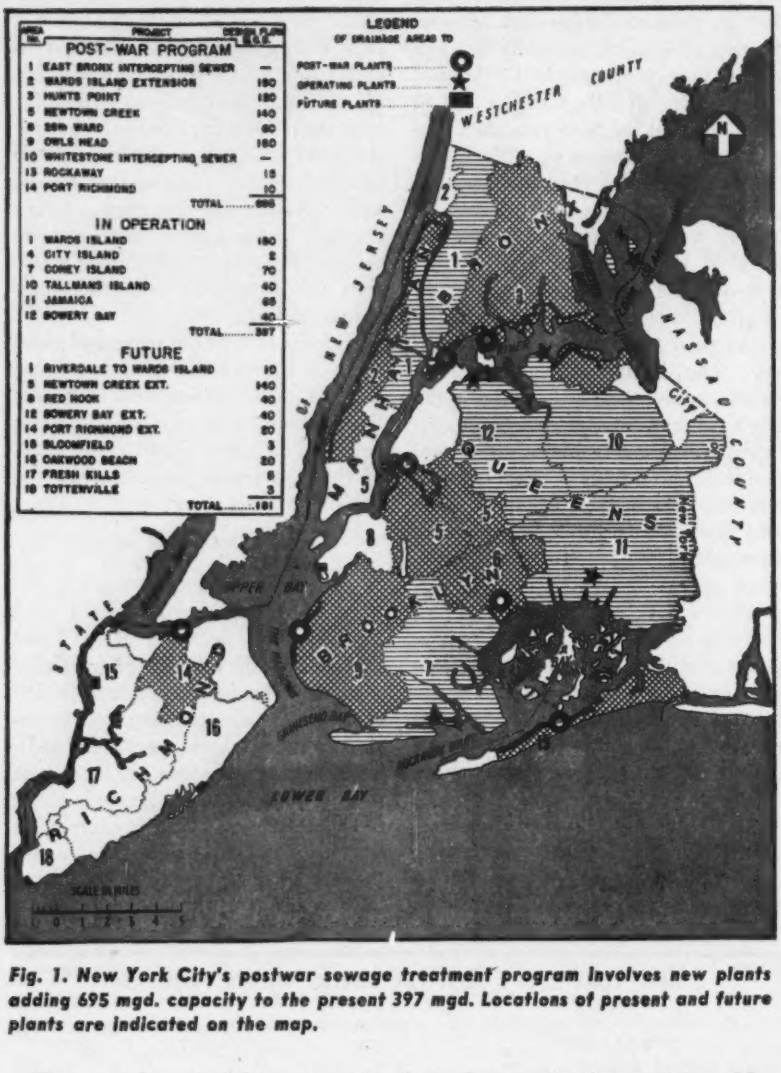


Fig. 1. New York City's postwar sewage treatment program involves new plants adding 695 mgd. capacity to the present 397 mgd. Locations of present and future plants are indicated on the map.

The general scope of the program is indicated in Fig. 1. The largest single project is that for the collection of sewage from the upper west side of Manhattan and passing it through a grit chamber and an inverted syphon, about two miles long, to Wards Island, where additional capacity is to be provided. This project will involve a great deal of rock tunnel work and difficult open cut sewer construction. The main syphon will probably be driven in depth in excess of 500 ft. below sea level.

Typical of unusual conditions to be faced is that of the Owls Head project. This plant of 160-mgd. capacity will be built over land now under water. It will be supported on piles, and calls for the construction of a deep rock-faced dike for the retaining of the filled area. The sedimentation tanks of the plant will be covered, and advantage is to be taken of this large flat area for the provision of local playground facilities. These facilities are being worked out in conjunction with the Department of Parks, and the whole plant layout is to be blended architecturally with the adjacent parks and parkways (Fig. 2). Unusual precautions are to be taken in the control of odors and of gases from the plant. They will receive treatment by ozone before discharge into the atmosphere.

Another plant is that at Newtown Creek, which will serve areas in Brooklyn and Queens and will provide for treatment by plain sedimentation for 140 mgd. Later, the plant will be doubled in capacity to serve areas in lower Manhattan. In the planning of this work, advantage is being taken of some of the newer forms of structural concrete. The pump and power house and grit chambers and sedimentation tanks of the plant will be covered by reinforced concrete structures of the thin shell arch type, whose general appearance will be as indicated in Fig. 3.

Plans for complete treatment by the activated sludge process will be provided at Hunts Point, 120 mgd.; as an extension to the Wards Island plant, 200 mgd.; and at the 26th Ward plant, 60 mgd. This latter plant has been completed under existing contracts to the extent that treatment by sedimentation will be possible by this spring. The provision of a pump and blower house and the auxiliaries necessary for full activated sludge treatment is scheduled for the first part of the postwar program. The completion of this plant, together with the 15-mgd. plant to serve the Rockaways, which is also in the program, will remove all the major sources of pollution in Jamaica Bay.

In order to provide for the disposal of the largely increased volumes of sludge from the new plants, our sludge ship "Navy" will be supplemented by two additional ocean-going sludge vessels.

Extensive hospital program

New concepts of hospital design and operation, coordinating structure with function, have been developed through the close collaboration of the Department of Hospitals and the design forces of the Department of Public Works. The situation with respect to chronic hospitals is a case in point.

Twenty-five percent of all beds in our municipal general hospitals are occupied by the chronic sick. As the average stay of a patient in a general hospital is ten days, and the average stay of a chronic is ninety days, this means that every chronic occupying a general hospital bed deprives nine very sick people of the general hospital facilities. Also, the average daily cost per patient in a general hospital is $4.61, while that in a chronic hospital is only $1.50. Were there enough beds in the city to take care of the custodial chronics, thousands of them could be treated at the lower cost.

Furthermore, the initial investment involved in the construction and equipment of a custodial chronic hospital is much smaller. The cost of a general hospital is from $5,000 to $10,000 per bed, depending on whether the hospital building alone is considered or all its services and auxiliaries are included. The cost of

stodial chronic hospital is about
000 per bed.
With the increase in the average
n of life, chronic illness becomes
ever increasing problem in our mu-
ipalities. To deal with this prob-
realistically, the city has included
its postwar building program four
itutions for the chronics, three of
stodial nature and one of acute
onic nature, amounting altogether
about 5,850 beds. Of these, 2,500
replacements of beds in existing
olete buildings and 3,350 are new
ilities. If only a thousand of these
ls were to be occupied by transfers
m general hospitals, at an average
ing of $3 per day per patient, there
uld be a daily saving of $3,000 or
out $1,000,000 per year. Spread
r a number of years this saving
ne would pay the entire cost of a
able institution.
Six new general hospitals are also
luded in the postwar program.
ce in most general hospitals the
in and the auxiliary buildings have
n built from time to time without
rdinated planning, it is doubtful
ether an opportunity has ever be-
e presented itself in any part of the
rld to plan six entirely new 500-bed
eral hospitals at once, each valued
$5,500,000, including the cost of
site. Here, also, is an opportunity
establish basic principles approach-
the ideal that it is possible to cre-
with modern building technology.
t is considered that the first task of
community in medicine is preven-
. The out-patient department is,
refore, being made the most impor-
t element in the building group,
l is placed so as to be most readily
essible from the main street front-
. The main hospital building is
ced to the rear where it may enjoy
et and be oriented favorably to the
exposure. Between the two ele-
nts is a wing containing the general
inistration, food preparation and
major modern diagnostic and
rapeutic facilities. Many other
concepts of efficient layout are
ng incorporated in these buildings.
The training of nurses has not kept
e with the tremendous growth in
nand since World War I, and to
edy this situation the city has de-
ed to provide additional nursing
ining facilities at general hospitals
icient in size to sustain a training
ool. A typical example is the
eens General Hospital Nurses'
Training School illustrated in Fig. 5, which will provide classrooms, laboratories, physical training facilities, and living and recreational facilities for 200 student nurses and the required supervisory and teaching personnel.

Many new health centers

In 1935, the city was divided into 30 health districts, each serving about a quarter million population, and it was planned that each district should have a health center, plus health substations and baby health stations, measured by its special needs. This long range program contemplated the design and construction over a period of years of 65 buildings, with a total cost of $20,000,000.

At the outbreak of the war, 25 buildings had been erected in accordance with this program. The postwar program has accelerated the design of 20 of the remaining buildings, and it is intended to have complete plans and specifications, as well as contract documents, ready with the arrival of peace.

The principal activities of the health center will be the housing of facilities for clinical treatment of communicable disease, the educational facilities in combating of same, the recording of vital statistics relative to births, deaths and marriages, provision of health services in cases of tuberculosis, venereal diseases, dental, eye, child care, infant and maternal care, plus the care of certain preventable diseases. In addition, facilities are provided for a wide variety of nursing services, including teaching, home visits, and clinic assistance in elementary schools.

Supplementing the major health centers, the sub-stations bring, in a localized form, the major or simplified services closer to the home district where they are needed.

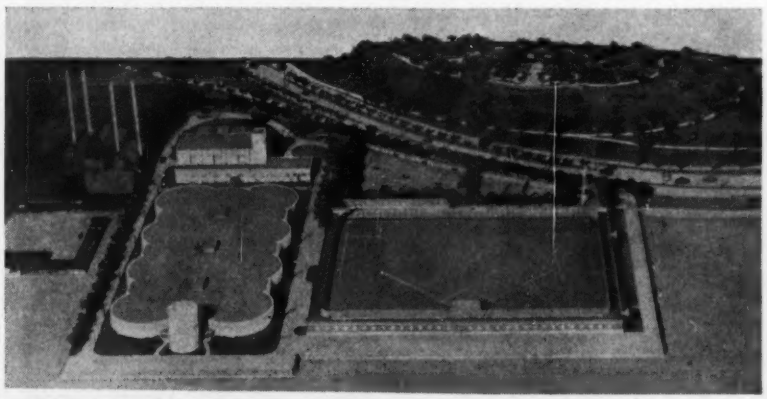
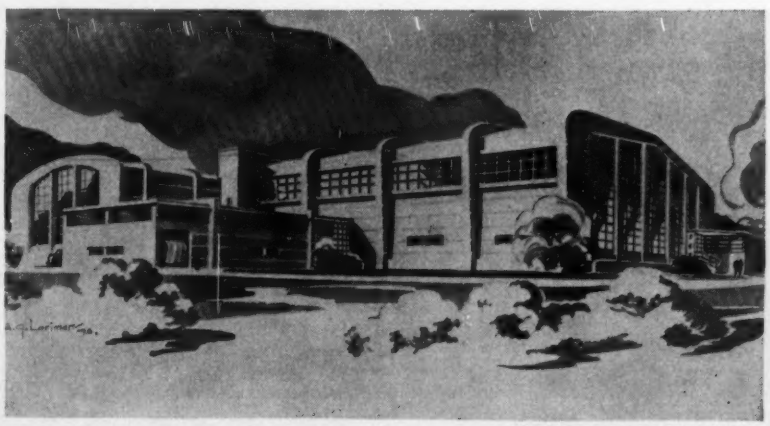


Fig. 2. How the Owl's Head sewage treatment plant in Brooklyn will look. Extending out into the Narrows of New York Bay, it will be built on piles and filled land. Integrated with a park, its structures will be roofed to provide recreation fields. This is a picture of a model.



All Renderings by A. G. Lorimer

Fig. 3. Newtown Creek sewage plant, providing for treatment by plain sedimentation, will be housed in an unusual concrete structure of thin shell type.

In order to provide for the equipping and repair of all mobile fire apparatus, an unusual repair station has been made a part of the program. As much of this equipment is of extreme length, the main repair shop is to be constructed with a thin arched concrete shell of 120-ft. clear span, 500 ft. long, flanked by 40-ft. spans forming machine shops, ladder-making shops, and other auxiliary accommodations.

These continuous concrete shells, flush on the inside and with the ribs on the exterior, permit the use of rolling forms, cutting greatly the cost of the usual fixed centering. On this basis, it has been possible to design an all fireproof structure costing less than the usual exposed steel truss long-span factory type. This extra safeguard is of great benefit in a structure of this nature where hundreds of thousands of dollars of highly specialized equipment may be housed.

Bridges in the program

The program provides for design of nine new bridges and alterations to existing bridges with a total estimated cost of $16,000,000. All of the bridges are of the movable type—six bascule, two swing, and one lift. The six bascule bridges are replacements of antiquated, obsolete structures. Only one of these projects, that for the new Ship Canal bridge over the Harlem River, will provide a completely new vehicular crossing. In some cases the new bridges will provide additional channel way for the operation of marine traffic. In all cases they will improve conditions for the movement of vehicular traffic.

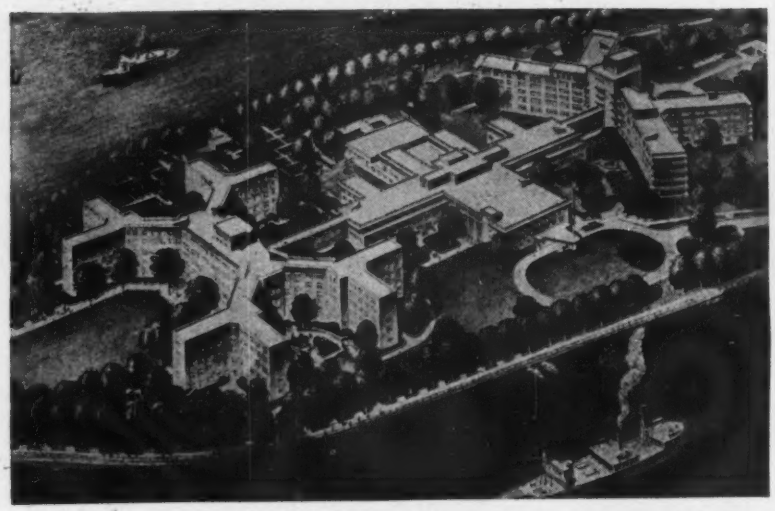


Fig. 4. A 2,000-bed chronic hospital which will be located on Welfare Island in the East River. Its estimated cost is $6,000,000.

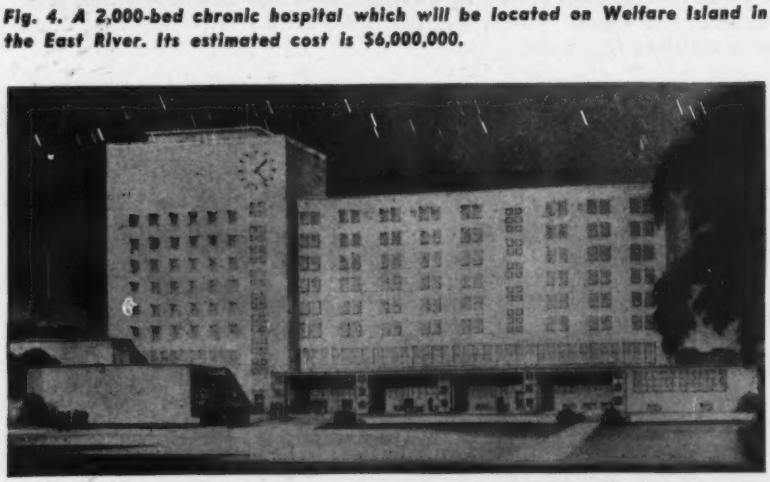


Fig. 5. Nurses' residence and school being designed for the Queens General Hospital. Extensive provisions are being made in the city's new hospital program for the training of nurses.

One of these projects is for a new bridge over Newtown Creek, to be called the Vernon Avenue Bridge. Located east of the old Vernon Avenue Bridge, it will connect the Boroughs of Brooklyn and Queens, and provide a much needed improvement in highway and waterway traffic facilities. Wider roadways will adequately accommodate the heavy local waterfront highway traffic, as well as through-traffic from the proposed Brooklyn-Queens connecting highway by way of Oakland St. Greater channel underclearance in the closed position of the new movable span will cut down the number of required bridge openings, and thus greatly reduce the interruptions to highway and waterway traffic.

The new bridge, Fig. 6, will be a double-leaf bascule span having 150 ft. of horizontal clearance and 37 ft. of underclearance. With the plate-girder span and concrete ramp approaches, the project will have an overall length of 2,625 ft. Two 34-ft. roadways separated by a center mall, and one 8-ft. sidewalk, will be provided.

The approaches of the Newtown Creek Bridge pass over four East River railroad tubes, a double track rapid transit tube, the Midtown Vehicular Tunnel, and a 72-in. water main that extends the entire length of the project. The estimated cost of the work is $4,331,000, which includes the cost of some street improvements in the vicinity of the approaches.

Wholesale produce market

A fresh fruit and vegetable wholesale market is being designed to replace the present market, which covers an area of several piers and the blocks along Washington St. from Hubert to Vesey Sts. in Manhattan. The existing market has been located in this area from the time produce was first brought into New York, and little has been done to modernize the methods or facilities. As much as 235,000 carloads of fresh fruit and vegetables have been handled in the market in one year by boat, rail, and automotive transportation.

Since produce is brought to this market from all parts of the country, and represents about one-eighth of the produce shipped in the United States, the market is of national importance, and the problem of its improvement is very complex.

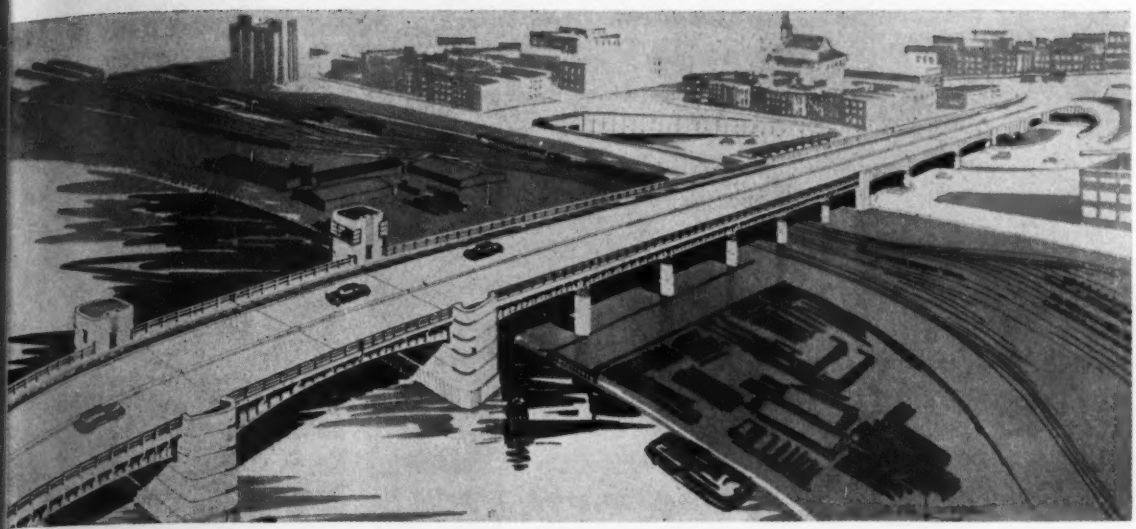


Fig. 6. Double-leaf bascule will provide a new crossing of Newtown Creek at Vernon Ave. between Brooklyn and Queens. Five other bascules, two swing spans and one lift span are also in the bridge program.

The sales areas will be arranged to provide for the rapid turnover of perishable goods and with adequate traffic facilities within and leading away from the street, and will result in considerable saving in money to the consumer. The plan will attempt to produce these results with as little interruption as possible.

The public works program will also include twelve garages, three garage additions, and three section stations for the Department of Sanitation; twenty-three new regional and branch libraries; seventeen new fire houses; and ten new police stations.

Construction priority schedule

The Mayor has recently appointed a committee consisting of Park Commissioner Robert Moses, chairman; John C. Riedel, chief engineer of the Board of Estimate, and the writer, to prepare a construction schedule of postwar projects on a priority basis. In addition to determining the relative urgency of the various projects, this entails a detailed study of the factors inherent in each project, requiring a finding as to the different classes of labor and availability of types of material, amount of employment which will be provided, as well as the cost of the project.

Studies thus far indicate that within a year from the start of construction, postwar public works can provide employment for approximately 200,000 on-the-site workers. This peak can be maintained for about a year, after which it will taper off. Any such schedule for construction made at this time, however, must be considered as tentative and flexible so that it may be adapted to the actual conditions.

A program of this size cannot be executed without some complications. They have arisen, but they have not been insurmountable. For example, at a time when drilling contractors have been busy with war work carrying high priorities, and while manpower of the type required was in great demand by war industries, it was necessary to obtain subsurface information on a tremendous scale. Fortunately, there was, in the Department of Public Works, a subsurface exploration section with men and equipment for taking borings. Without this only a fraction of the present preliminary explorations would have been possible. In many instances, in order to keep the program moving, it has been possible to make tentative foundation designs without all the desired borings. The designers have been able to proceed because of the general fund of geological data which our subsurface exploration section has been collecting for the past five years.

The construction program, which is estimated to cost $993,000,000, providing at its peak jobs for 200,000 men here in New York City, must be financed. The city treasury cannot carry this task alone, and its funds must be augmented by federal and state monies. The total funds that can be made available by the city, state and federal governments divided by $993,000,000 will equal and determine the actual size of New York City's postwar construction. It seems logical that, if this country can spend billions to win this war, expenditures comparable to wartime appropriations may have to continue perhaps for a period of one year, and then be reduced on a graduated scale until the shock of transition has been absorbed. The preservation and protection of that which we will have won in this war justifies such expenditures.

Any program to be of real value must be ready before the end of the war. That means final contract documents, final contract plans and detailed specifications must be available for instant use when needed. This is especially true in the case of public works. It has been estimated that postwar dislocations and readjustments will require new employment or re-employment for fifty million people in industry and agriculture. Obviously this will affect every element of our national life. It is, therefore, essential that all component parts of our national life, private as well as public, participate now in postwar planning. While no agency alone can insure success, the failure of any component part will jeopardize the entire program.

New York city can point with pride to the sound postwar program inaugurated before Pearl Harbor, and to the efficiency and dispatch with which it is now being executed.

The writer wishes to acknowledge the assistance of his Department of Public Works staff in compiling the information in this article.

Stage Set for a Housing Boom

Jacob Mark,
Consulting Engineer, Brooklyn, N. Y.

***Contents in Brief**—Factors expected to play a part in postwar housing are a backed-up and growing demand for housing, subsidies for financing, housing laws, availability of materials and labor, participation of government agencies, and recent experience with large developments. General conclusion is that the annual housing construction program of this country for the first few postwar years will total a million new units costing six billion dollars. In addition a four-billion dollar backlog of work required to repair and modernize existing structures is believed to exist.*

A STUDY of expected postwar construction shows that at the war's end this country should have the greatest housing boom ever experienced. This year, in keeping with the Department of Labor report that the 1944 construction total will be about 60 percent of that of last year's, residential housing will be greatly reduced, although not in proportion because some war plant areas still need housing. Neither is much housing construction expected in 1945, unless the war is over. However, once the world is at peace, the housing boom should follow. The reasons for this view are best explained by a quick review of housing construction in this country in the past few decades.

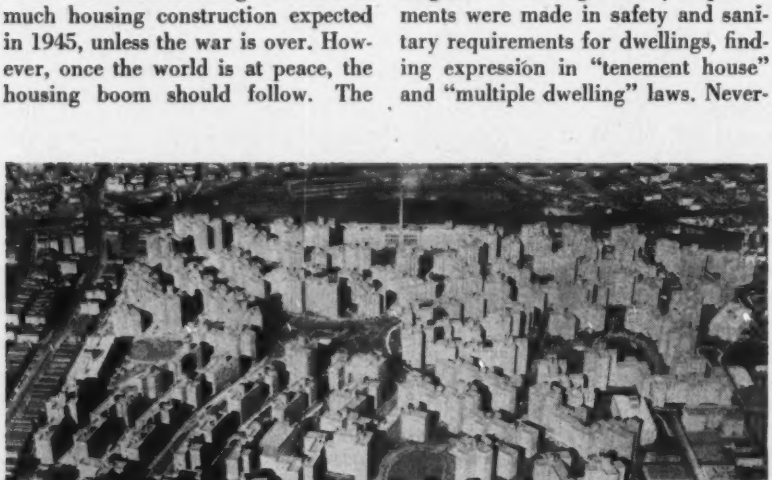
In 1916 New York City adopted zoning laws that were followed during the next 20 years as a pattern by more than 1,200 municipalities. These laws generally established rights of cities to control uses of land, percentages of land occupancy, and heights of buildings. Many improvements were made in safety and sanitary requirements for dwellings, finding expression in "tenement house" and "multiple dwelling" laws. Nevertheless, our cities—laid out for horse and buggy—have not kept pace with the automobile and the airplane.

The laws and regulations improved the standards of housing, but did not aid in producing adequate housing on an economic level for the majority of families. This group has had to be content to live in older, dilapidated or sub-standard housing. Occasional relief was found for small numbers of families through building operations by semi-philanthropic organizations that sponsored developments for low-wage groups.

After World War I, when building costs had risen and there was almost a complete cessation of building, New York City stimulated building activities in dwellings by granting tax exemptions for limited periods. In effect this exemption subsidized builders to encourage production of housing.

The dammed-up demand caused by cessation of building during World War I, plus stimulation through tax exemptions, resulted in a building boom that continued until the crash of 1929. Then there was again a cessation of residential building on a large scale, relieved only by the impetus of projects financed by the Federal Housing Administration. Next came a flurry of activity up to 1937 with FHA help, extended on small dwellings to 1941, and finally a short lapse before the present war.

During the depression some houses were built under supervision of the Farm Resettlement Administration, as were a limited number of projects financed by the Reconstruction Finance Corp., a few state and city housing authority jobs, a number of developments by the U. S. Housing Authority and numerous private projects. In total, this work, plus Home Owner's Loan Corp. repairs, and new building and repair guaranteed loans by FHA, created a sizable amount of home building. However, despite the large expenditures,



The most outstanding housing job built to date by an insurance company is the Parkchester development in the Bronx, New York City. This project houses 12,000 families on a well planned site providing playgrounds and park areas.

Built as a $1,000,000 PWA project, this Miami development provides 2-room dwellings renting as low as $2.85 weekly.

ll these activities have not provided dequate housing for the country's 7-million families.

The biggest reason for poor hous- g in the past was the impossibility o economically construct and operate t a profit high-standard housing for he low-wage groups with the rents ey were able to pay. Other factors eside low-wages contributing to sub- tandard housing, included: Anti- uated building laws; union restric- ion on labor and materials; trade ombinations of contractors and ma- erials men; high wages of building raftsmen; antiquated hand methods f building; unreasonable charges y title insurance companies; high nterest and service rates by financing rganizations, and unscientific tax as- essment procedures.

The average wage earner was un- ble to pay all the charges engen- ered by these causes, which explains he insistent pressure for city, state nd federal housing to aid the low- age earners crowded into dwellings onsidered below minimum decency y present standards. If relief was o be found for these citizens, it was o come only through subsidies in arious forms.

However, the original purpose of ousing subsidies—to give low-wage arners decent habitations at rents ey can afford to pay—is now be- g subverted. When projects by city ousing authorities were first opened was a policy to restrict occupancy o those tenants whose earning were bout four times the low rents, which arely covers the cost of such serv- es as heat, janitor, and ordinary pairs. Only projects of this type were to receive benefits of the federal, state, and city subsidies. Now under stress of war, these tenants, by combined pressure, are continuing to live in the housing, even if their wages go beyond the original limits. Also, some projects have been assigned to war workers earning today's highest labor rates.

As government-financed projects multiply, a new privileged group is developed. These persons living in the new fine fireproof buildings, at rents paid in most part by taxing their neighbors, will find ways of staying there. Outsiders, envious of their lucker neighbors will work to get in and will press their legislative representatives for more and better housing. The purchaser of a one-family house has to pay equity money, taxes, interest and amortization—in fact repurchase his home every twenty years. The dweller in subsidized housing pays no such charges.

Subsidized housing here to stay

Nevertheless, subsidized housing is so well established that it will form a large part of postwar work. Materials men and contractors are not averse to it; they sell their wares no matter who does the building. The majority of people, being low-wage earners, favor the projects. The politicians, who have joined the social reformers in procuring federal, state and city housing laws that required subsidies for taxes, construction, interest and even some maintenance costs, will rival one another in vote-getting by legislating for housing with cheap rents. In addition, since the loans are government guaranteed, the banks readily enter into the plan, so much so that short-term loans covering city housing authority jobs are made at rates of less than one-half percent per annum.

In addition to subsidized housing, a huge program of single-family housing under FHA sponsorship can be expected to develop because of the potential market that lies in present high earnings and savings by workmen and small businessmen. Also, the public has been made more "house" conscious during the past decade, and it received much aid from 20- and 25-yr. mortgages with constant payments and freedom from worry over mortgage fees and renewals. From its inception to the end of 1942 FHA approved and guaranteed loans on privately financed housing projects to the extent of over 7¼ billion dollars for housing 1,230,844 families. Major defaults at the end of 1942 were less than one-eighth of one percent of the loans outstandstanding. This remarkable record indicates the place FHA can play in post-war housing.

In a similar way, HOLC did a magnificent job in stopping foreclosures during the period of stress between 1933 and the outbreak of war. This agency made loans of about 3½ billion dollars in over a million investments. By the end of 1942 over three-fourths of the loans had been repaid and there was a 52 percent reduction in amounts loaned. The corporation, as of the end of 1942, had possession of less than three percent of the properties mortgaged—another remarkable record in view of the fact that the properties

were those on which owners were in arrears of interest and taxes. Such an agency can again be revived, if needed, in the postwar period.

Also, the RFC, which made construction and premanent loans for housing before the FHA got into its stride, has sufficient flexibility to fill many gaps in the financing of building projects. Similar financial mechanisms will no doubt be used again, since they fit into our banking and free enterprise systems.

Government guaranteed loans

It is worth noting that the government agencies all aided the mortgagees and bankers directly and only indirectly the home owner. The banker was bailed out by HOLC and RFC loans, and it is the banker whose mortgages are guaranteed by FHA. These agencies are functioning because the private financial agencies took no initiative.

By using the guaranteed form to encourage loans, the government avoided construction through its own agencies. Full liberty of action was left to architects, engineers, enterprisers and builders to formulate developments, make plans and purchase materials and labor. Larger projects than usual were initiated, and higher standards in providing playground space and parks as well as good sanitation were attained.

The National Housing Administration reports that in the first ten months of 1943 over a half million new housing units were completed in war centers. In the three years prior to November, 1943, under the emergency program for war materials centers, nearly 1½-million units were completed. These efforts can be continued in the postwar period without opposition from any quarter. The government is guarantor, umpire or lender only, not the performer.

Furthermore, economists are agreed that to employ our returning men we must have an active, dynamic and abundant industrial economy. Housing will play an important part, as the estimated minimum annual need for new housing construction is about a million units costing over six billion dollars. This sum will only take case of obsolescence, new families and replacements; it does not include repairs to existing structures, which are estimated to provide a present blacklog of four billion dollars.

City housing authorities have land, plans, and commitments to start many jobs. The big insurance companies, such as Metropolitan, New York Life, Prudential, and Equitable, have recently taken an interest in large-scale housing developments and will continue to do so. To find an outlet for their vast resources in the face of dwindling investment opportunities these companies succeeded in some states in procuring privileges of investing a portion of their funds in housing developments.

A revolutionary change in the housing field that further encourages these companies in housing was the recent passage of the urban redevelopment law in New York State. This law was framed originally to encourage limited dividend corporations to clear slums, but proved too complex for operation. Last year, under this law, the New York legislature granted life insurance companies a 25-yr. tax exemption on housing improvements and the right of eminent domain for assembly of properties. This extraordinary measure should make many jobs possible if the municipalities can carry the tax load. Metropolitan Life Insurance Co. has already assembled one large plot in New York for postwar work. The savings banks may also be granted similar privileges. With their resources much work may be engendered in New York State, and similar laws may be passed in other states.

Prefabrication possibilities

The prefabricators have also worked diligently during the past decade and especially under the exigencies of war. Many developments by resourceful companies are placing before a house-hungry public new and attractive, easily constructed houses. In addition, many laboratory investigations are under way for further prefabrication improvements and economical housing and marketing thereof. The sponsorship of prefrabicated houses is in the hands of powerful and able companies that will do much in the postwar period to sell their products.

Other reasons why the postwar housing industry will be extraordinarily active include: Work will be needed. The government is committed to encourage housing. The technical and mechanical skills will be more abundant than in the prewar period, because much has been learned in regard to housing construction and many new men have been trained. Numerous new materials and combinations have been introduced. Many plans are ready, waiting only the release of materials, and much land has been purchased by public housing authorities and by operators for public, private and FHA developments.

Better building codes needed

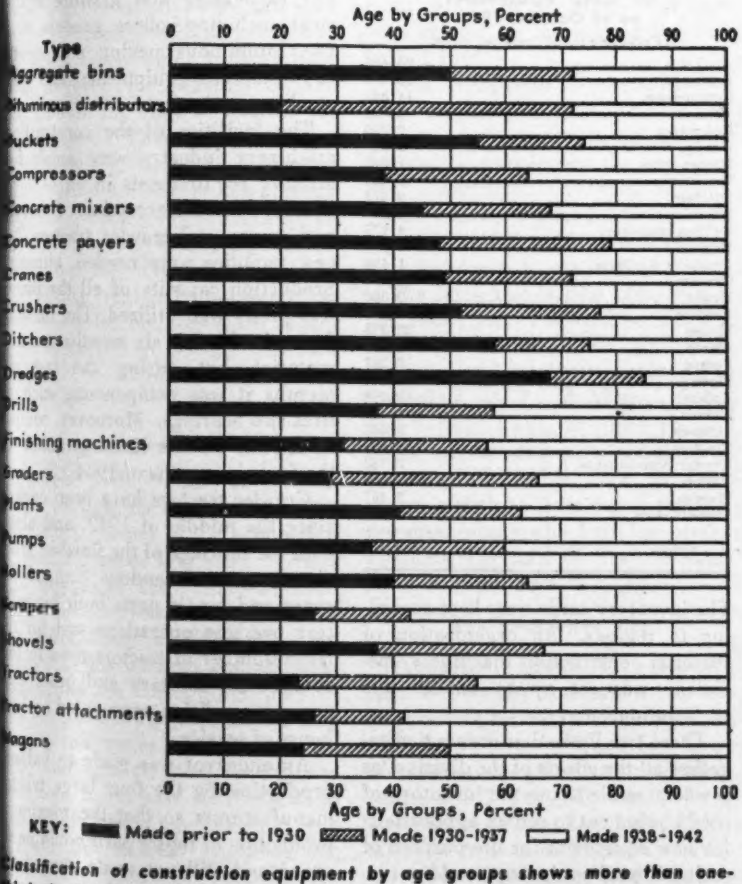
Present building codes under which construction and maintenance of buildings are carried on should be revised immediately in anticipation of expanded construction programs. The latest and most comprehensive building code in the United States was published in 1942 by the City of New York. It serves, in part, as a model for many codes throughout the country. However, the "Building Laws of the City of New York" are printed in four large books and are so complex in requirements that engineers and architects must be familiar not only with construction but with a maze of legal forms. These latest laws, originating in the community with the most varied experience and greatest volume of building construction in the United States, are far behind the progress being made in new materials and new methods of construction. Furthermore, it is only in part a scientific code, and is largely the resultant of forces applied by interested material producers, labor organizations, political pressures, and inertia. The code is not in accordance with practical experience in steel, welded, and reinforced concrete construction, nor in plumbing and electrical work.

To summarize, immediately after the war the greatest housing boom ever experienced in this country should start. There are no parallels for comparison. Never before has there existed so perfect a combination to force unbounded activity in this field. We now have—for housing—new laws with public sanction, new agencies, many interests seeking self advancement and willing to push a big program, new materials, money, willing financial agents, skilled men, new techniques, and a market. Furthermore, whether we like subsidies or not will make no difference, publicly subsidized housing will move forward apace.

Construction Equipment Goes to War

***Contents in Brief**—The tremendous increase in production and use of construction machinery indicates the important part construction plays in modern warfare. The manufacturing industry, guided by WPB, has met the increased military demands and has managed to keep civilian requirements fairly well satisfied. Used machinery has been registered, classified and distributed where it will do the most good. Indications point to shipping most of the new equipment and many used machines overseas for some months yet. Although surveys show that equipment left behind is rapidly approaching obsolesence because of age, there still will be enough new and used units available to start the postwar program of construction.*

ALONG WITH GUNS, tanks, naval craft and planes, construction equipment has gone to war. Prior to Pearl Harbor the equipment industry produced an average volume of $200,000,000 per year. In 1942 this was stepped up to $625,000,000, and in 1943 production topped $720,000,000 in value. This last year's output used up 1,300,000 tons of steel and 10,000 tons of copper; and some 82,000 workers were directly employed by the industry. Equipment demands for the first quarter of 1944 indicate the 1943 rate will be maintained. This huge increase in construction machinery has been accomplished with very little increase in plant capacity, the industry taking the job in stride.



Classification of construction equipment by age groups shows more than one-third of all units to be over 14 years old, while another third has been in service for 4 years or more.

Military requirements

Military requirements, of course, dominate the equipment field today. Not only is there a great demand for construction machinery in preparation of overseas bases, but many of the versatile, rugged units developed for peacetime construction are actually being used for combat service. The high rate of loss in transit and under war conditions, and the short life due to abusive service, have intensified the military demands for equipment. For these same reasons, spare and repair parts requirements to service military-owned units are several times those based on normal use, throwing an additional load on manufacturing plants.

An example of the rapid increase in parts requirements is furnished by the experience of crawler tractor manufacturers. In the third quarter of 1942, the industry shipped tractor parts valued at $13,400,000. During the final quarter of that year shipments amounted to $15,000,000. In 1943 the figures, by quarters, stepped up fast (in millions of dollars): 17.5, 22.6, 28, and 30. Thus, in 1943, parts production amounted to $98,100,000, topping by 50 percent the value of all tractors made in 1938, $60,000,000. In 1940, parts manufacture amounted to 15 percent of the industry's output; today it runs above 50 percent in some plants.

Meeting civilian needs

The armed forces alone could probably use all the construction machinery the industry can produce. Yet, to preserve the vital civil operations necessary to support the war effort, some new equipment must be allotted to non-military use, such as domestic construction, mining, logging and agriculture. Lend-lease and miscellaneous manufacturing industries also come in for a small share of the output of new units. Roughly, in 1943, 85 percent of new equipment was allotted to the Army and Navy, the remaining 15 percent being distributed

among the non-military claimants. This same ratio is being carried over into 1944, but is subject to change either way, depending upon military developments.

How control is handled

The Construction Machinery Division of the War Production Board was set up to control manufacture of new equipment and distribution and allotment of new machines and repair parts. M. B. Garber was director of the division up to Dec. 1, 1943, when he was succeeded by Henry M. Hale, with Ralph Dano and Robert Carroll as assistant directors. The division is broken down into various departments, each headed by a specialist in his line. The director also has the help of a board of seven consultants from the industry, advisory committees of manufacturers, an advisory committee of contractors and an advisory committee of construction machinery dealers.

With demands far exceeding the industry capacity for new production, the task of the Construction Machinery Division has not been an easy one. It has endeavored to substitute used equipment for new when possible, and, in all, has done a remarkable job in supplying equipment needs everywhere. The division does not act arbitrarily, but proceeds with allotment orders only after consultation with all interested agencies. Allocating the small share of new units to non-military claimants is one of the biggest headaches.

Limitation orders issued

Back in 1942 it became evident that all articles of construction machinery would be tight during 1943. With that in mind, the War Production Board issued, after careful consideration, two limitation orders designed to assist in the distribution of new machinery, and endeavored to secure the best possible information on availability of used equipment. These two orders are L-192 and L-196. Order L-192 has just been revised, easing some of the earlier restrictions.

Limitation order L-192 was one of the broadest of such orders issued by WPB in that it included all types of construction machinery with the exception of crawler tractors (covered by orders L-53, L-53a and L-53b). This means it includes the largest kind of strip shovels down to very small off-the-shelf items, such as small rock drills, pumps, etc. This order covers not only the distribution of the end product, but also covers repair parts.

The L-196 limitation order provided for the registration of all used construction equipment owned by everybody in the country except war agencies. The number of items included has been adjusted from time to time as it became evident that this overall registration was not needed. As a result, there were over 350,000 pieces of construction machinery registered.

TABLE I—PRODUCTION OF FOUR CLASSES OF NEW CONSTRUCTION EQUIPMENT

Number of New Units Shipped

	'37	'38	'39	'40	'41	'42	'43
Crawler Tractors	*	*	20,127	27,245	29,849	26,570[1]	24,600
Motor Graders	3,700	3,258	3,505	4,312	5,968	*	3,607
Scrapers (large)	901	1,310	2,057	3,008	4,839	*	5,040
Cranes—Shovels	3,395	2,246	2,778	3,414	4,830	*	7,482

* Data not available.
[1] Drop due to decrease in small sizes only.

TABLE II—CONSOLIDATED INVENTORY OF USED EQUIPMENT as of Oct. 14, 1943

(Excluding military-owned units)

Air Tools	23,483
Buckets	15,391
Compressors	14,340
Concrete	6,867
Conveyors	2,206
Cranes, crawler	9,320
Cranes, truck	1,645
Crushers	3,443
Ditchers	2,373
Derricks	1,037
Drilling machines	4,477
Engines	4,580
Finishing machines	1,439
Graders	33,113
Hoists	9,360
Loaders	3,013
Mixers	25,318
Plants	3,433
Pumps	6,267
Plows	2,775
Rollers	13,263
Shovels	14,401
Scrapers	9,562
Tractors	48,322
Tractor Attachments	7,183
Towars	303
Wagons	2,197
Miscellaneous	63,070
Total	332,181

The inventory cards were kept according to regions. An organization of regional construction machinery specialists was set up to handle this registration.

These two limitation orders tied together all the efforts of the division, as it was possible to use the inventory of used equipment to screen applications for new equipment for the purpose of seeing if used equipment could not be substituted for new. That effort was carried forward at regional offices before applications for new equipment were sent to Washington.

This screening of applications resulted in the placing of more than 12,000 pieces of used equipment during 1943. The estimated value of new equipment saved by this effort is $100,000,000.

Classes of equipment

For analysis, the various items of construction machinery were broken down into six main classes: (1) Crawler tractors and allied equipment such as bulldozers, winches, scrapers, etc.; (2) shovels and cranes; (3) excavating and grading equipment, including rollers, graders, etc.; (4) bituminous paving equipment; (5) concrete equipment; and (6) crushing equipment.

The facilities of the construction machinery industry were ample for military requirements in all of these classes, with the exception of shovels and cranes and crawler tractors. No new facilities were needed, although production capacity of all the plants was pretty well utilized. The limiting factor in the first six months was raw material, but during the last six months it was components, such as tires and bearings. Moreover, components will be the limiting factor in the first six months of 1944.

Crawler tractors have been critical since the middle of 1942, and along with the shortage of the finished product came a tremendous demand for spare and repair parts both for military overseas operations and for the large number of tractors used in this country for military and other purposes, a condition aggravated by long hours of service.

An endeavor was made to balance production by the four large tractor manufacturers so that the maximum production of repair parts could be secured and still not waste any of the plant facilities, particularly assembly lines. No extremely large additions

cilities were added to the tractor industry, because again there was a mit as to the amount of raw material ailable in the overall picture. However, many new tools and other means expansion were used, including subntracting. As a result, there was me increased production in 1943 er 1942, but the parts production ore than doubled in one plant and in other it tripled.

About the middle of 1943, after it came evident that more material ould be available, and also because nk production was being cut back to me degree, the Army decided to exnd facilities for one size of tractor what had been a tank arsenal. This pansion is purely a military one, volving a government-owned plant d equipment. This new facility will t get into effective production until e middle of 1944, but by the end of e year it will give the Army approxiately a 35 percent increase in that e size of tractor in both end prodt and parts. This move affects criti components very little, for the ant will be mostly self-contained.

Since March, 1942, 15 percent of larger size crawler tractors have en reserved for essential civilian stribution, the other 85 percent for ilitary needs. This 15 percent is disbuted by the Construction Machinry Division to fifteen non-military imant agencies. This small quanty does not nearly satisfy the requirents, but the division, through its ld efforts (regional specialists) has en successful, and expects to be still ore successful in finding idle used uipment to augment the distribun of new.

Shovels and cranes also tight

Shovels and cranes have been arly as tight as tractors. In 1943, s than 5 percent of the production standard types and sizes (½ to 3 .) of crawler and rubber-mounted its was reserved for non-military encies. Though facilities were not panded, this industry through subntracting was able to double its norl production. The turnover in used ovels and cranes has been satisfacry, and through 1943 no job has en reported to have suffered due to k of this type of equipment.

Also, the military demands for ovels and cranes has exceeded the oductive capacity. A separate mili- facility has been established in another tank arsenal, which will produce 500 additional ¾-yd. machines in 1944.

Much of the effort of the Construction Machinery Division during 1944 will be concentrated in securing proper turnover of used equipment. It should be remembered the Army also secured a very large amount of both new and used construction machinery, particularly since 1937, through direct purchase and recapture on construction work. It is anticipated that the military uses for used equipment in this country will ease considerably by July or August, 1944.

Military rebuilds equipment

Early in 1943, the Construction Division of the Corps of Engineers developed a plan for rebuilding and reconditioning the equipment coming from military projects. This effort was decentralized, and authority given to the district offices, who either established rebuilding shops of their own or made deals with machinery distributors. Practically all the equipment owned by the Army will have been rebuilt by the end of the first half of 1944.

This equipment is reconditioned into two general classes: (1) that requiring new repair parts for shipment overseas to supplement the supply of new machinery; (2) that reconditioned with used parts for troop training and for a limited amount of construction work in the United States.

The Navy also owns a considerable amount of heavy construction machinery. For handling this equipment three depots have been established at Lonesdale, R. I., McAllister, Okla., and Vernon, Calif., to which all used units, supplies and parts are shipped. Some rebuilding is done in these shops, and some is let out to machinery distributors who have the proper facilities. The ratio of Navy to Army equipment is 1 to 5.

New production high

Production figures for the past decade show the tremendous increase in construction equipment output. In 1935 the industry shipped (exclusive of automotive equipment) machinery valued at $121,000,000. The 1937 volume had more than doubled to $247,000,000. A drop to $209,000,000 occurred in 1939, but by 1941 production had increased to $330,000,000, stimulated by the defense construction program. During the first war year, 1942, the value rose to $625,000,000, and last year was $722,000,000.

Detail figures on various types of equipment further emphasize the growth in production. They are given in Table I.

Figures on used equipment are of little value because of the constant change in this field. An inventory of used units, made by the Construction Machinery Division as of Oct. 15, 1943, shows 332,181 units exclusive of those owned by the war agencies. This inventory is consolidated in Table II. No figures on equipment owned by the armed forces are available at present, but both the Army and Navy are fast increasing their stocks and by now probably have acquired more than half the idle used machines that have been available in this country.

Equipment becoming obsolete

Whatever the ratio between private and government owned used equipment may be, it is certain that, in most classes, the stock of construction machinery is fast becoming obsolete with age. The accompanying chart, made from a WPB survey of last spring, indicates that by the end of the war much of the equipment not actually used up will be much too old for efficient performance. More than one-third of all equipment now in use is over 14 years old, and another third is from 4 to 14 years old.

The equipment situation at the end of the war is hard to predict. Army and Navy authorities believe there will be a few government-owned used machines left in this country—most of them will have been sent overseas and will not come back. On the other hand, some leaders of the equipment industry doubt the ability of the armed forces to use up all they now have on hand and will acquire up to the time hostilities cease. In all probability, however, there will be sufficient equipment available to start the postwar construction program, especially considering the new units that are always in the funnel between the plants and point of use.

However, it is known that construction machinery and spare parts for the maintenance and repair of such machinery, has moved overseas at a high rate in proportion to troop movements overseas, and will probably continue to be so for some little time.

Acme photo

Symbolic of wartime education—men in uniform move in as civilian students leave a university building.

Engineering Education in War and After

Ivan C. Crawford
Dean, College of Engineering, University of Michigan

***Contents in Brief**—1943 was the year that the Army and Navy moved in on the nation's engineering schools. Only about 25 percent of present students are not in the armed services, and these are largely juniors and seniors who have been deferred to complete their education. Navy program fits into college curricula and habits better than Army's, whose objectives are quite different. Educational programs for training war plant personnel, begun in 1940, are about finished. None of war training programs will cause any significant changes in engineering education, unless perhaps to encourage growth of technical institutes for sub-engineering training.*

ENGINEERING COLLEGES have proved to be a great national resource during the past year of war and of preparation for the struggle that lies ahead. No other professional schools have been asked to provide so wide a variety of programs or to deal in such large numbers of students.

Instructional activities have been centered around regular curricula for civilians in the upper classes, consisting of students deferred from military service by Selective Service; the launching of the Army Specialized Training Program (ASTP) and the Navy V-12 Program; the continuance of the Engineering, Science, Management War Training courses; and special courses for Army and Navy personnel.

In addition to these activities the colleges have contributed many staff members to government service and war industries, either as consultants or on a full-time basis; other staff members have devoted much time to research work connected with war projects.

Consideration of the problems facing the schools in the immediate future and postwar period have claimed some attention. Discharged veterans are already returning; cessation of hostilities will see large numbers enrolling in college to continue an interrupted education. Whether or not to add more technical institutes to the public educational system is a question which should be answered in the near future.

The Army and Navy programs

In order to understand clearly the Army and Navy programs it is necessary to have in mind their objectives. The Army desires to train specialists in the fields of civil, electrical, chemical, and mechanical engineering, who, upon completion of college work will find places in the Corps of Engineers, Signal Corps, Ordnance Department and Chemical Warfare Service. Graduates may be "(1) selected for further training in an officers' candidate school; (2) recommended for a technical non-commissioned officer; (3) returned to troops; (4) in exceptional cases, detailed for very advanced technical training; (5) made available, in very exceptional

cases, for technical work to be done out of the Army, but deemed highly important to the War effort." Also, the Army program contains shorter curricula in basic science, with specialization in surveying, internal combustion engines, communication, and acoustics and optics; graduates are assigned to the Army Ground Forces.

For the Navy program, Rear Admiral Jacobs says "its primary object is to give prospective naval officers the benefits of college education in those areas most needed in the Navy." Naval authorities have expressed the desire "in as far as possible, to preserve the normal pattern of college life."

Term lengths differ

The term length in the Army program is 12 weeks. Trainees in civil engineering are allotted six terms; in electrical, mechanical and chemical engineering, seven terms; or 72 and 84 weeks, respectively. Those to be assigned to the Ground Forces are in college 36 weeks. Navy specialists in engineering, also Civil Engineering Corps, and Construction Corps (naval architecture and marine engineering) trainees, are allotted eight terms of 16 weeks (the Navy term is 16 weeks) or a total of 128 weeks, which closely approximates in length the civilian 4-year curriculum. Other categories in the Navy program—aviation cadets, deck officers, engineers (general), spend respectively, two, four, and six terms in college.

The Army program was scheduled to start early in March, but did not get under way until a month later. The numbers of trainees finally arriving at the institutions selected to inaugurate the program were only a small portion of those expected. Since then the program has become more firmly established, although even now the colleges are not able to plan very far in advance on matters relating to the numbers to be handled.

The Navy opened its program on July 1. In general, it has been able to deliver to the schools the numbers of students agreed upon.

How trainees are handled

In order to accommodate the numbers of students involved it has been necessary to employ the facilities of many non-engineering schools to give the instruction covered in the first year or year and a half of the programs. At the end of the third term, in the Army program, trainees are to be transferred to engineering schools which are to give the advanced phases of the various curricula. The Navy has endeavored to send recent high school graduates interested in engineering and giving promise of success in that field directly to accredited engineering colleges. However, opportunity is provided for transfer to these schools at the end of the second term, of trainees who have demonstrated an aptitude for engineering.

Credit for college work

The Engineers' Council for Professional Development has announced the following policy with regard to the granting of college credit for the Army and Navy courses: "Insofar as the Army Specialized Training and the Navy College Training are offered within the accredited curricula of ECPD, ECPD will concur in the granting of credit by engineering schools. In particular, recognition of the specialists' curricula fo the Navy College Training Program to satisfy requirements for an appropriate bachelor's degree in engineering will be sanctioned. Similar approval will be extended to proportional credit for shorter curricula of the Army and Navy College Programs."

Both the Army and Navy make the initial selection of high school students in their last semester by means of specially designed tests which indicate the applicant's intelligence standing and his training in mathematics. The Army selectees are sent for a period of military training upon graduation from high school and prior to entering the assigned college. The Navy prospect, after taking the mental examinations, appears before a board composed of civilians and a naval officer where the final selection is made. He is then sent to the educational institution without passing through a period of military training.

Engineering faculties have learned that in wartime they, together with all other elements of the population, must adjust themselves to situations which change without notice from day to day. Curricula whose content has been worked up by specialists employed by the War and Navy Departments replace curricula built up through years by faculties; terms start and terminate on dates set by the armed forces; student quotas are set for institutions, but the numbers to be accommodated in the several fields, i.e., civil, mechanical, electrical, etc., may not be known until after the trainees arrive.

The colleges recognize the magnitude of the problems undertaken by the services in setting up and administering these huge programs; they also realize that in both programs the student is being educated directly for usefulness to the service in which he finds himself, and that military considerations must prevail in the formation of courses of study and the length of time which the trainee may remain in college.

At the end of 1943 it is estimated that from 25 to 30 percent of the students in engineering schools are civilians. This condition exists because Selective Service has authorized the deferment of such students who are in line to graduate by July, 1945. Present juniors and seniors, at least the great majority of them, will complete their work by February of that year. Entering freshmen must be below the draft age of 18 and consequently are few in number. Therefore, by early 1945 it seems likely that the civilian enrollment will be down to 15 or 20 percent of that of 1939-40; that is unless there is an unexpected change in the Selective Service regulations.

Deficiencies made up

As graduates leave, the Army and Navy trainees, now largely in what corresponds to the freshman and sophomore stages, will enter the more advanced phases of the engineering curricula and replace to a considerable extent the deficiency of civilians.

The similarity of the Navy program for engineering specialists to the civilian curricula in electrical, civil, mechanical, and aeronautical engineering, and in naval architecture and marine engineering has been noted. Where schools have Navy contracts, it seems reasonable to expect that they will adopt the Navy curricula for the duration so as to avoid the necessity of running two programs concurrently. In fact, some schools have already done so. This is a feasible procedure since Navy regulations permit civilians in Navy classes.

In the cases where schools have contracts with the Army, difficulties are encountered because these curricula are quite different from those leading to degrees, and civilians may not be mixed with Army trainees. Schools having contracts with both the Army

and the Navy must necessarily conduct two programs, one for the Army and the other for the Navy and civilians.

Early in 1942 a movement was inaugurated in some sections of the country to encourage high school students to begin college training before the completion of secondary school. Only to a limited extent have students of this category been admitted to engineering colleges. Among accredited schools of engineering there has been but very little lowering of standards; undoubtedly this satisfactory condition is due in considerable measure to the accrediting activities of the Engineers' Council for Professional Development.

The ESMWT program

Since late in 1940 the engineering colleges have been offering courses designed to train "persons to meet known and potential shortages of engineers, chemists, physicists, and production supervisors." Congressional appropriations have borne the expense involved, and the entire program, (officially the Engineering, Science and Management War Training Program or ESMWT), has been administered by the U. S. Office of Education. For the year 1942-43 the cost amounted to approximately $22,000,000; 153 engineering schools have participated in the work; and 75 percent of the trainees enrolled were in courses for engineers.

Trainees in the engineering field were of two general types. In the first group were those possessing educational and professional qualifications which fitted them to undertake courses corresponding roughly to the undergraduate, and in some cases, the graduate courses of the technical school. In the second group were those without technical training and, frequently, fresh from high school.

Members of the first group received instruction during one or more evenings per week while filling positions in industry, and thus prepared themselves for wider responsibilities. Without doubt the usefulness of these students in the war effort was enhanced by the instruction received. However, it is very difficult, if not impossible, to find even an approximate measure of the effectiveness of this portion of the program; the persons concerned were already in war industry as a rule, and unless they performed their work better or were advanced to more important positions there would be no net gain to the war effort. There is much evidence to show there was a net gain on both counts. Also, some were brought back into engineering activities who had left the field to engage in occupations not connected with the war effort.

The advantage to the nation resulting from the training of the second group, i.e., inspectors, draftsmen, engineering aides, is easily demonstrated. In this case there was a direct addition to the manpower pool.

The Engineering Defense Training Program (the forerunner of the present one) was brought into existence as an emergency measure to help provide technical personnel for war industry. It and its successors have functioned with a minimum of red tape from Washington and have been quite successful in reaching their objectives. However, as expansion of war industry eases, the need for such programs grow less; in fact, there has been a definite decline in the numbers enrolled in the subprofessional full-time courses during the past few months.

Some of the difficulties

A superficial survey indicates that the facilities of engineering schools have been quite fully employed during the past twelve months. Close examination discloses, however, that these facilities have not been used at full efficiency. And for this situation there are a number of very good reasons.

When the first groups of ASTP students came to the campuses last April they were supposed to be composed of former students whose college career had been interrupted by the war and who would be in the advanced classes. The groups did not "pan-out" well in this regard. The numbers were only a fraction of those anticipated by the War Department, and but relatively few were qualified to go into the junior and senior courses, the advanced phase of the program. In addition, Army reservists and R.O.T.C. students were called from school into the service, leaving a blank that was not filled.

Navy V-1 and V-7 trainees, students enlisted in the Navy but on an inactive status, were permitted to remain in school .The new V-12 trainees came directly from high school, with a few from the Fleet. The V-1's and V-7's were absorbed in the new program, but the group coming from high schools and the Fleet did not need the services of the teachers of the more advanced engineering courses. Since the Selective Service regulations deferred students in engineering, these composed the main group of advanced students during the fall term of the past year, except in those schools having Navy contracts where V-1 and V-7 trainees have been congregated.

Inasmuch as both Army and Navy students are now coming into the advanced phases of their programs, this situation should be remedied in the near future.

Staff problems

However, it would be a mistake to assume that engineering schools have had any manpower to spare among the members of the staffs. Those whose services could be spared, and in many cases those whose services could not be conveniently spared, have taken leaves of absence to go with government departments and with war industry. The real problem has been to guess far enough in the future so as to determine what staff would be necessary, and then to retain that staff on the campus.

On the whole, it is probably close to the truth to say that the majority of engineering colleges have had about all they could efficiently handle.

Changes after the war

Much has been said about the effect of the temporary programs on engineering education after the war, and generally there is the implied assumption that the impact of these programs will lead to major changes. Experience gained may bring to light some desirable changes, but so far there is nothing to indicate the necessity for any sweeping alterations in curricula content or length of time to be devoted to college work. Perhaps the prevailing impression that these emergency programs will have an influence on postwar developments is due to the fact that the services, particularly the Navy, have had unsatisfactory experiences with many trainees on account of insufficient training in high school and college mathematics. It is not necessary to say that the college men with lack of mathematical preparation did not come from the engineering colleges.

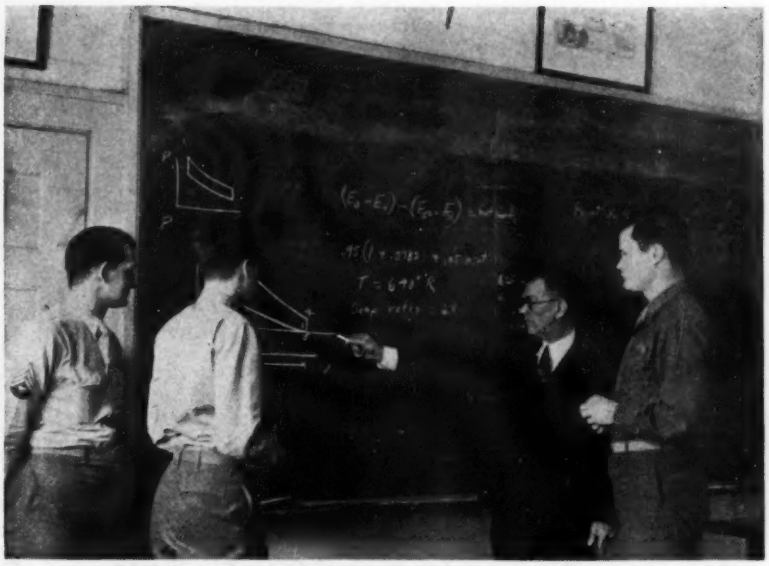
Courses in English are given in the early phases of each of the service programs. The amount of this subject is less in both programs than is usually found in the civilian program. Both the Army and Navy have inserted American history courses in the first year schedules; the Army has a course in geography extending over the first three terms, and the Navy program calls for a semester course in psychology and a two-term course in economics. All other courses in the two programs are strictly technical in nature. Thus it can easily be seen that the programs are not likely to have a revolutionary effect on the engineering curricula insofar as course content is concerned.

Graduate enrollment in engineering increased to a marked degree during the years prior to World War II. There is every reason to believe that this tendency will continue when peace returns.

In 1939 a committee of the Society for the Promotion of Engineering Education made a report on the Aims and Scope of Engineering Curricula in which it was recommended that a sequence of humanistic-social studies be inserted in all curricula and extended throughout the normal four-year program. In general, schools have made provisions for elective studies during the last two years of their programs, so that the introduction of the humanistic-social sequence is feasible. The importance of such studies, in view of the engineer's place in society, is granted by all. The post-war period will probably witness their more general adoption.

The engineering curricula of the present and the graduates from those curricula have clearly proved their worth in this emergency. The programs of the armed services, even for general purpose men, are based on such curricula. Young men trained in engineering have been eagerly sought for by all branches of the armed services, combat and staff, and by war industry.

The accelerated program has amply proved its worth as a war expedient. Some very practical considerations indicate that it will not long survive the cessation of hostilities in any large proportion of the schools. In the first place, the conducting of such a schedule throws a greatly increased load on the budgets of the schools; the necessary funds must be secured from some source. The great majority of our schools depend upon the public purse and none of this variety charge a tuition fee large enough to pay for the cost of instruction. To secure the funds in peace time it would be necessary to convince state governing boards and legislatures that the added expense was a worthwhile expenditure of public funds. The accelerated program, even in wartime has not been universally adopted, largely for the above reason, even though the production of an engineer in two and two-thirds years as against four years has been a decided aid to the manpower situation.



2. An engineer's war requires technically trained men, to the development of which engineering college teachers have devoted their time and their talents.

Secondly, we must consider, for normal times, the attitude of the student and his parents toward such a schedule. The entering student is young, say eighteen or eighteen and a half years of age. Quite generally the summer vacation is used to gain experience and cash by engaging in some type of useful work. Each fall he comes back to the campus with an added maturity due to the experience of the summer and added age; the time has not been lost to him or to society. Also, except under war conditions, there is no way of forcing a student to attend sessions throughout the year.

It should not be forgotten that for many years some schools have had summer sessions at which engineering students could hurry up the date of graduation. Students to whom such expediting was of value, attended. The general experience, however, shows the attendance to be only a small fraction of that at the regular sessions. In the future these summer sessions will undoubtedly be continued, perhaps even lengthened; but the value of additional acceleration must be demonstrated.

Technical institutes

A possible postwar development envisioned by a number of educators and industrialists is a great increase in the number of technical institutes. By this term we designated an institution administering a program extending over a period of one or two years, intensive and practical in nature. Graduates of such institutes have rendered satisfactory service as draftsmen, testmen, inspectors, in plant operation and maintenance, positions which are often the starting jobs for many of the graduates of the engineering college. The entire subject is rather thoroughly covered in a report of the Society for the Promotion of Engineering Education in 1931, a report entitled "A Study of Technical Institutes." Since that date there has been no particular extension of the number of institutions engaged in this field, in fact there has been a tendency for such schools to develop into degree-granting institutions. And while there is little or no doubt about the opportunities existing, the American student and his parents have been more impressed with desirability of a college experience and a degree.

Seabee construction equipment on Munda airfield in New Georgia

Building Under Fire . . .

THE NAVY'S SEABEES

Lt. Fred M. Mosley
Civil Engineer Corps, U.S.N.R.

***Contents in Brief**—From Tarawa to Salerno, and at many points between, the Navy's Construction Battalions saw action in 1943, and won praise from many quarters. By the end of the year Seabee strength was approaching 262,000, and about half of them were overseas. Airfield construction has been one of the principal jobs, often carried on under fire, but Seabees also handled extensive pontoon operations in connection with landing attacks and operated floating drydocks and did ship repair work at advance bases.*

At Bougainville, Cape Gloucester, and the myriad islands of the Pacific, the Navy's Seabees, sometimes known as the "Seven Seas Construction Co.", continued in 1943 to bulldoze their way toward Tokyo. And it may be recarded that when the Berlin-bound invasion troops shove off, the "fighter-builders" again will be among the first Americans on the beaches of Europe.

Much has transpired since the first naval construction regiment of 3,300 men was authorized Dec. 28, 1941—21 days after Pearl Harbor. For one thing, by the end of 1943, there were nearly 262,000 Seabees in service. And for another, about half of them were overseas.

During the year intensive training of units continued at Camp Peary in Virginia, Camp Endicott in Rhode Island, Camp Lee-Stephenson in Maine, Camp Rousseau and Camp Parks in California. Not only were construction battalions turned out in a steady stream, but other specialist groups, for which actual warfare had demonstrated a need, were trained. These included longshoremen for unloading ships, demolition squads to clear obstructions from the approaches to enemy beaches and base maintenance units to take over when construction battalions moved on toward new front lines. Despite the fact that it has been a formative period, the Seabees have demonstrated a combination of construction "savvy" and Yankee resourcefulness that has earned them a unique position in American military history.

One of the first Seabee detachments to leave the United States, which landed on Bora Bora, a virtually unknown island in the South Pacific, had early opportunity to demonstrate this resourcefulness. Discovering they had no insulators for their phone and power lines, their worried gaze fell on several dozen cases of neatly stacked Coca Cola bottles. A little tin (no trouble locating this since the men had been living out of tin cans for months), a bit of manipulating, and the glass Coca Cola bottles became Seabee insulators. Thousands are now being used throughout the South Pacific, and many Seabees will contend that they are better than the more conventional type.

Scores of instances of similar quick thinking by Seabees on many "Island X's" throughout the world have since come to light. But the Seabees are fighters as well as builders. They first proved that when they rebuilt Henderson Field time and time again

spite the efforts of the Japs to dis-dge them.

During the early days of the see-w struggle the Marines pushing rward in the jungles found their nks stopped dead in their tracks; e wily Japanese had discovered an posed mechanism on the tanks lnerable to a quick thrust with an on rod. The same knack of turn-g the trick with materials at hand at the builders first displayed at ora Bora helped save the military uation on Guadalcanal. They gath-ed up discarded oil drums, flat-ned them out, and used them to rmor plate" the trouble spot on the nks. After that, all the crow bars the Solomons didn't help the Jap-ese.

Teamed up with the Marines, Navy mphibious units and Army assault rces, the Seabees round out the ost capable and versatile task rces the war has seen. The Seabees nd the Marines complement each her particularly well. Their side-y-side association through the Pa-ific campaigns has developed in em a mutual admiration of the her's abilities. Sometimes this close omradship finds expression in good atured kidding. Seabees on one land erected a sign inviting Leath-rneck neighbors to "Get Your Sea-ee Badge Today," telling the Ma-nes they were entitled to wear the dge after serving with the Sea-ees for three months. The Leather-ecks evened the score with the con-ruction men, a more mature group han most fighting units, by inviting ny Seabee under 55" to join the larines.

On Bougainville, despite fierce en-my opposition and almost unbear-ble living conditions, the Seabees ook just five weeks to build the first irfield. This 4,200-ft. fighter strip, uperimposed on a swamp, cut 70 iles off the flying routes of Ameri-an planes attacking Rabaul. The eabees could well pause a moment, roud of their five-weeks construction ob on Torokina Field. Instead, just 3 days after their first field had been rned over to the air force, they had iva Field, a new 6,500-ft. base for ght and medium bombers, ready for se.

The building of Piva Field, named fter a Bougainville river village of hat name, was accomplished with eroism and utter disregard of dan-ger. To survey the site for this field, the Seabees penetrated Japanese territory well in advance of the American front lines. With the strip site finally determined, the battling construction men set to work, bivouacing so close to the Japanese lines that not only were bulldozer operators and survey parties under fire, but Japanese snipers harassed the men nightly in their camp.

Like Torokina Field, Piva was carved out of the heaviest of jungles. Torokina took five weeks to complete; Piva, six. Later a third strip, located in the Empress Augusta Bay area, was built. The toughest job, the Seabees said, was to push roads through the swamps to the airfield sites, often under Japanese fire.

Thirty miles off Bougainville, an uninviting patch of land called Treasury Island juts out of the sea. Treasury Island was securely held by the Japanese until late October, when the Allies attacked. Landing with the first wave of assault troops, Seabees started on their combat construction assignments while still under bombing, machine gun and mortar attack. One Navy builder, using his bulldozer as a tank, leveled a Jap pillbox, burying its twelve occupants alive. Two others, operating a bulldozer under enemy fire, refused to quit when the transmission balked. Despite the bullets flying about them, they kept the machine moving at top speed by shifting gears with an ordinary screwdriwer.

Despite extremely limited equipment, the Seabees during their first month on Treasury Island prepared the beaches for landing craft; began work on an airstrip; built 21 miles of road through heavy jungle; established communications centers; built gun positions; erected a fighter director center; and constructed a dock, which was essential for future offensive operations. Work on a permanent camp, galley, mess hall, sick bay, and trade shops was begun the first day after the invasion.

Next came the attack on New Britain Island. The same day the Marines captured the two Japanese airfields at Cape Gloucester, the Seabees moved in to patch up the battered strips and get them in shape for use against the retreating enemy. The Seabees rebuilt the two airfields while the Marines established defensive perimeters around their positions and repulsed abortive enemy attacks.

The Japs, beaten back from the airfields, established a defensive line along a stream ten miles inland. A frontal assault would have been costly; the enemy was strongly intrenched in pillboxes on both sides of the creek. Working around the Japanese position appeared impossible because tanks were unable to pass through the extraordinarily thick jungle. However, daredevil Seabees solved the problem by driving their bulldozers through the entangled vegetation, smashing down trees while Australian and American infantrymen followed up, making a lane for the tanks.

Seabees on Adak in the Aleutians complete a dock for an advance base. Note the Quonset huts dug into the hillside for protection from the williwaw winds.

Reaching the area nearest the stream's west bank, the bulldozers benched out a road on the steep cliffs. Other Seabees, under the protection of General Sherman 75-mm. tanks, followed through and, despite withering fire from pillboxes on the other side of the stream, speedily built a bridge across. The infantrymen stormed over. The Japs were routed.

In the recounting, these incidents may have assumed an unduly prominent position in relation to the rest of the vast program the Seabees have undertaken in the Southwest Pacific area. Other fighting branches of the "Seven Seas Construction Co." have been preparing the way for the inevitable attack against Japan proper by readying such oceanic stepping stones as Vella Lavella, Espirito Santo, Efati, New Caledonia, New Britain, New Guinea, and islands in the Russell, Samoan, Florida, Fiji, and Solomon groups. If the details of Seabee pontoon operations, floating drydocks, and ship repair work are not yet as well known as their superlative job of airfield construction, it is only because the cloak of military secrecy has not yet been lifted.

The short, but savage, attack on the Gilbert Islands opened a new phase of American operations in the Central Pacific. Most of the Seabees landed the third day. Twenty-four hours later, an American plane made an emergency landing on the partially rebuilt Tarawa airfield. Two days after that, on November 26, squadrons of fighter planes were roaring down the field at regular intervals to go on combat air patrols, and transport planes were arriving and departing on daily schedules.

To rebuild the field in record time, the Seabees started work while Japanese snipers were still active. They also ran a gauntlet of Japanese land mines, some of which were adjusted to go off with only 3½ lb. of pressure. The runway, as built by the Japs, had a 10-in. coral base topped by 1½ to 3 in. of coral concrete, which was of insufficient strength for American planes. It was necessary for the Navy construction men to scrape reefs and bring up wet, live coral for the new field surface.

The Aleutian campaign, now that the Japanese have been removed from the scene, no longer is of major news interest. But the Seabees, who landed with the first troops ashore at Kiska and Attu, are still fighting two other foes—ground and weather. Typical of what the Seabees have been facing is the experience of a group assigned the job of building an ammunition dump on one of the smallest and bleakest of the isolated islands. Working through a whole series of "williwaw" storms and on the edge of a sheer 900-ft. cliff, they hand-chiseled caches from shale rock with pick, shovels, and an occasional charge of dynamite. Nine days after landing, they poured their first concrete, converting a couple of stray hot water heaters, a lone coal stove, and some strips of canvas to emergency use to keep their mixture from freezing right under their implements. The calibre of Seabee construction was such that when an Army Ordnance Department inspector checked the installation, he reported the work as being far superior to any of the same type he had seen in his many years of experience.

Comdr. Joseph P. Blundon (C.E.C.), U.S.N.R., who was officer-in-charge of the first Seabee battalion to land on Guadalcanal, is convinced that American superiority in base construction in the Pacific area, both in the northern and southern theatres, will prove to be one of the vital factors in eventual victory over the Japanese. "I speak conservatively," said Commander Blundon, "when I say that our Seabees can build more in a week than the Japs can in a month. Furthermore, our men can build airfields on difficult terrain, whereas the Japs, using slow hand labor, are limited to easily converted sites, such as cocoanut groves." He revealed that at Guadalcanal the Japs did not even have such standard construction equipment as carryall scrapers, power shovels and dump trucks.

"One Seabee operating a 12-yd. scraper can move as much dirt in a day as 150 Japanese laborers," he explained. We found at Guadalcanal that 100 Seabees could completely repair the damage of a 500-lb. bomb hit on an air strip in 40 min., including the replacing of the steel mesh mat. The same repair job would take the Japs more than three hours, and then they would only have filled the hole with dirt."

In a statement issued on Dec. 28, the second birthday of the Seabees, Secretary of the Navy Frank Knox said, "Every major amphibious operation of the Navy has found Seabees among the first to land. Almost every airfield, supply depot, or other installation built since Pearl Harbor has been a Seabee record for speed and ingenuity."

During the Sicilian campaign, Seabees were among the first off the invading LSTs. At Salerno, a Seabee bulldozer preceded the first tank ashore. If the Seabees have any voice in the matter, they'll also be among the first to land on the continent.

A Seabee logging and lumbering detail brings in a load to the sawmill. The logs are mahogany, and the jungle and road conditions are typical of those around many South Pacific bases.

Marine Corps Engineers photos

rine Corps Engineers take over Tarawa beach and move in supplies.

Building Under Fire . . .

MARINE CORPS ENGINEERS

Lt. Col. James G. Frazer
U. S. Marine Corps

***ntents in Brief**—Established since this war started, Engineer units of Marine Corps have been in the thick of the fight in many landings on my held beaches. The author was in command of such a unit that landed Guadalcanal, assisted in the capture of the airfield, and completed con- ction, then built roads and other facilities on the island. Recent landings Tarawa and Bougainville are described.*

E MARINE CORPS ENGINEERS are a hting part of a fighting team. Engi- er organizations are heavily ipped with infantry weapons and men are basically trained as in- trymen. Fighting to protect what y have built is not a catch phrase a recruiting slogan. It is an ex- ted and relished part of the job. the Pacific theater, Marine visions have been used to spearhead tain offensive operations. The engineer units accomplish under fire the technical work so necessary to the successful completion of an attack. Attack planning is based upon the rapid completion of every task, utilizing local and natural materials to the utmost. No attempt is made in the initial phases to perform heavy or permanent types of construction, which are left for follow-up units equipped for that type of work with heavy equipment.

In the attack on Guadalcanal information became available that a bridge would be required over the Ilu River to facilitate the advance of the assaulting infantry. Aerial photographs were studied and a tentative bridge site selected. Standard bridging equipment was not available to the Engineer unit assigned to this particular job, so the problem was solved with typical Marine Corps ingenuity. A few engineers slipped down into the holds of their ship and removed all the select timbers protecting the "skin" of the ship. These were sawed quickly into the proper length and bolted together for stringers with bolts "borrowed" from the ship's carpenter shop. Dunnage and shoring timbers were pulled out of the cargo

An A-frame made of scrap iron and mounted on the rear of a tractor saves back-breaking work in corduroying a road on Bougainville.

and cut for deck planks. Saddles were built and fitted to landing craft, and the prepared bridge lumber was loaded in the vehicles. "D" day arrived. For the first time the ship's captain saw the silver painted lumber as it was being swung from the holds. A quick investigation followed. The loud roaring that ensued quickly convinced the engineers that the hostile shore would be a far more hospitable place than that particular ship. Within an hour after the first wave hit the beach, the bridge was across the Ilu River and ready for use.

An important engineer task commences as the bow of the first landing boat scrapes on the beach. When a landing is made on a hostile shore, the attacking troops must bring with them tremendous quantities of supplies and equipment. As this material is brought ashore from the transports and cargo ships, a shore party, also known as a Pioneer Unit of the Engineer Regiment, takes over. It is their function to unload the small boats and move the supplies and equipment across the beaches into dispersed dumps. Shore party units are equipped with light tractors, bulldozers and cranes for improving beach facilities and performing salvage operations. The shore party also is equipped with quantities of beach roadway matting. When this material is laid over the soft sand, it provides sufficient support for vehicles to move freely from the ramp-type landing boats to the firm ground.

Combat engineers were used as infantry for the first two days on Guadalcanal. They organized a defensive position to protect the supplies on the landing beach while the infantry pushed westward toward Lunga Point. When the Japanese base was captured, the engineers moved to the vicinity of the airfield, laid down their weapons, picked up their tools and started work. Japanese air and surface attack forced the Navy Task Force to withdraw before many of the ships were completely unloaded, leaving the engineers with no heavy earth-moving equipment and a very limited supply of hand tools. Reconnaissance parties located Jap supplies of construction timber, explosives and some machinery and utilized these and other expedients from the very start.

Building under fire on Guadalcanal

From the day of landing on Henderson Field, Engineer units from the Marine Corps, Army, and Navy cooperated in its development. But the credit for completing this strip for the first planes to land belongs to the Marine Corps Combat Engineers of the First Marine Division. When taken over, the landing strip was 3,778 ft. long and about 160 ft. wide, located on a flat alluvial plain covered with grass that varied in height from one to six feet. The Japs had started the runway fill from both ends and were working toward the center. This fill varied from a few inches to about 5 ft., the gap that was left requiring placement of about 10,000 cu. yd. of decomposed coral. The Nips had little construction machinery—eight small gasoline-powered rollers used for compaction, a 30-in. gage railway with a gasoline locomotive and a dozen ¾-cu. yd. hopper cars provided one means of hauling fill from the borrow pits. Wicker baskets carried by laborer troops was their only other method of moving earth.

Marine Corps Engineers repaired some Jap trucks and these, along with the train and a few American trucks, hauled dirt to the air strip. Captured dynamite was used to loosen the earth, and captured hand shovels were used to load it.

When the original Combat Engineer Battalion was relieved of its work on the airfield, the personnel devoted their energy to other combat missions in all parts of the Division area. As the infantry pushed the Japanese back, road construction became a pressing problem. Guadalcanal is mountainous. From the narrow coastal plain the hills rise sharply to an average height of 6,000 ft. Many narrow ridges run down to the sea, forming deep ravines that are filled with dense jungle. The large number of roads required under these conditions presented construction difficulties. Heavy rains turned all jungle roads into a sea of mud so that even the "mighty" jeeps bogged down.

Where possible, roads were built in the ravines to take advantage of the defilade from artillery and machine-gun fire. This increased the difficulties encountered from rainfall runoff, as a comprehensive drainage plan for the roads was out of the question. Gravel fill and corduroy in the worst spots were the usual answers. Some culverts were made from oil drums welded end to end, and others were built of logs. Roads were pushed through while the engineers were harassed by sniper and mortar fire. In a few cases cableways were erected across ravines, saving many hours of back-breaking work for carrying parties.

Bridges, on the other hand, presented an easier problem. Highly satisfactory floating foot bridges were improvised from scrap lumber

empty gasoline drums. These ges were placed across streams in defensive positions to facilitate rapid lateral movement of in- ry troops. On one occasion a dge of this type was constructed er artillery fire.

small amount of standard mili- portable bridge equipment was ilable for vehicular bridges, and ved to be worth its weight in gold. as used as a tactical bridge and replaced by a permanent bridge oon as conditions permitted, thus ing the portable bridge available emergency use.

he Japs had stocked a consider- quantity of heavy bridging tim- which was utilized until the ly was exhausted. Framed trestle pile bents were used, piles were en by improvised rigs or sunk jetting, while cocoanut logs were most frequently for stringers. a few occasions, the steel roof es from demolished Jap hangars used for bridge trusses.

Improvised bomb shelters

Numerous bomb shelters were con- cted. These ranged from simple ered trenches to chambers tun- d into the sides of the hills, with oanut logs used for shoring. Light struction railway and hand cars e utilized to haul the spoil from face of the tunnels to waste piles. standard shelter, however, was mple rectangular cut made in the of a coral hill, pneumatic tools g necessary to cut the decom- ed coral. The sides of the shelter e built up with sand bags, and oanut log columns supported a that consisted of one or two rs of logs covered with sand bags. en available, sheets of ¼-in. steel e, salvaged from the Jap hangars, e added. These shelters were igned to be splinterproof, and they d many lives.

upply of potable water is a critical blem in amphibious operations. rine Corps Engineers are provided h portable and mobile purification ts which filter and chlorinate river er. On the larger islands in the ific, there is usually an abundance fresh water available. Captured e on Guadalcanal allowed flexi- y in the location of water sources. purification units and storage s were normally protected by d bags.

On Tarawa, an atoll type island, there was no readily available fresh water source. The engineers used mobile water distillation units to convert sea water into drinking water. Water is distributed to using organizations by 300-gal. trailer-mounted water tanks and standard 5-gal. expeditionary cans.

Bougainville and Tarawa

In the operations on Bougainville and New Britain, Marine Corps Engineers are encountering the same problems that were faced on Guadalcanal. In general, the terrain and climatic conditions are the same in that area, but more rainfall in the islands to the northwest of Guadalcanal increases the difficulty in the construction of all-weather roads. In swampy ground, roads are now being constructed on heavy corduroy subgrades.

To facilitate construction and to conserve vital shipping space, the Marine Corps Engineer companies have been equipped with portable sawmills. Extensive logging operations are being carried on, and rough sawed lumber of all sizes is readily available.

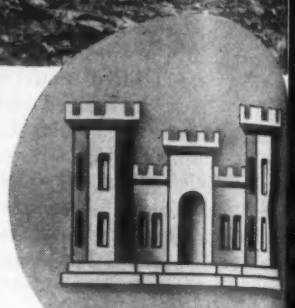
Flame throwers and explosives in the hands of Marine Corps engineers broke the backbone of enemy resistance in the battle for Tarawa. The fortifications, built of reinforced concrete, palm logs and sand-filled gasoline drums, withstood the terrific pounding from the air and sea bombardment remarkably well. Consequently, the assaulting Marines were met by concentrated small arms fire as they approached the beach.

Flame throwing units of the engineers were able to succeed where high explosives had failed. They worked their way to the pillboxes by ultilizing every scrap of cover and concealment. When within striking range of an embrasure, a squirt of flame destroyed the defenders and neutralized the bunkers. Explosive charges were hurled by hand into gun emplacements, or placed against the log walls. When the sides or tops of the strong points were breached, hand grenades were tossed inside. In a few cases angledozers were used to push earth into the embrasures. The bunkers were rendered ineffective and could then be completely reduced at leisure. On the third day of the battle, construction equipment was landed by a Seabee unit, and the repair of the landing field started.

History is repeating itself. Marine Corps Engineers, recently landed at Cape Gloucester on New Britain, are fighting with their flame throwers and small arms, continuing their airfield construction, road and bridge building, water supply, shore party work, and all the rest of the many combat tasks of the fighting engineers. They will continue to carry out their general mission to "facilitate the advance of friendly troops".

Contrary to U. S. practice, as much brush as can be obtained is used in airport fill over soft ground on Bougainville.

Engineer bulldozer in North Africa fills a bomb crater on an airdrome.



Building Under Fire . . .

THE ARMY ENGINEERS

Lt. Col. R. P. Rosengren
Chief, Technical Information Branch, Corps of Engineers

***Contents in Brief**—Whether building airfields in New Guinea and the Aleutians, or constructing roads in Africa and Persia, the Army Engineers in 1943 gave powerful pushes to the successful Allied offensives. Spearheaded by their bulldozers, they chalked up accomplishments that greatly enhance an already honorable history. And as combat troops or as behind-the-lines builders, they are ready for the great tasks ahead in 1944.*

THE ARMY ENGINEERS' year began with Papua and closed with Naples.

The successful conclusion of the Papuan Peninsula campaign on January 23, 1943, marked the great divide in Pacific warfare, our first ground victory over a substantial Japanese force in positions of the Japs' own choosing. Papua initiated a year of unbroken and continuingly successful offensives in the Southwest Pacific.

With the capture and repair of the port of Naples, our first campaign for the continent of Europe moved from the invasion phase into the land operations phase. Like Papua in 1943, Naples foreshadows, in the new year, continuing and successful advances.

Between Papua and Naples, either way, lies half a world. Only such distances can adequately suggest the tremendous engineering tasks required of our army in the year of 1943, a year that, more than ever, labeled this an Engineers' war.

When General MacArthur was ordered in February, 1942 to leave Bataan and proceed to Australia to assume command of the new Southwest Pacific Area, we possessed in all of New Guinea but one airdrome, no more than twenty-odd miles of hard surfaced roads, and almost nothing else—no adequate wharf facilities, water supply, storage areas, hangars or repair shops. One year later more than 100 airdromes in northern Australia and New Guinea had been built or made serviceable by Brig. Gen. Hugh Casey's Engineers working in close cooperation with Australian military and civilian construction men. Berthing facilities had been increased nearly five times; and wharfage handling facilities had been improved in every key Australian harbor. Nearly 15,000 miles of Australian roads had been constructed or improved; vast storage and repair depots built; and many water supply points established.

Airdromes in the South Pacific

The real magnitude of Engineer construction, however, is best indicated by some of the Southwest Pacific airdromes. Because of the twin necessities for dispersal and great capacity, each permanent aidrome is a major engineer undertaking. The base at Port Moresby, for instance, has a much greater runway capacity than that of the National Airport at Gravelly Point in Washington. But the runways are just the beginning. Four hundred miles of roads, 25 miles of gasoline pipelines, and berths for several ocean ships are a part of the installations.

To construct such mammoth airdromes without placing impossible demands on transport, Engineers have stuck to simple construction, utilizing local aggregates, with minimum tonnages of standard tar and asphalt

…des. Construction, in view of the …matic conditions, must emphasize …rough drainage and a wearing sur… completely dust-proof in dry …ther.

The Papuan victory was made pos… largely by the mass use of air …sport to carry an entire army …ss New Guinea's Owen Stanley …untains. Paving the way for these …p transports were Engineer-led …ve working parties clearing land… strips in the jungle. The Distin…hed Service Medal citation given …one engineer colonel, John Leif …rdrup, indicates the achievement: …ring the Papuan campaign, Colo… Sverdrup personally executed nu…ous reconnaissance missions in … Guinea, over difficult mountains … through swamp and jungle, far …ward of the areas occupied by our …ps, in order to secure vital infor…ion needed for engineering oper…ns. Utilizing native labor, which … recruited and trained, equipped … with hand tools, he constructed … great rapidity a series of air…ds urgently needed for the trans…t by air of troops and supplies to …tant and otherwise inaccessible …s."

Subsequently, the technique of the …gineer-Air Force team reached an …ctiveness in New Guinea far over…dowing the Germans in their con…st of Crete. The transport by air …both small and standard-size Engi… construction equipment (bulldoz… rooters, graders, sheepsfoot roll… etc.) and the use of the Corps of …gineers' steel landing mat sections, …olutionized airfield construction … requirements, and gave a mobil… to jungle landing strips that made …them true flight decks for the ad…ce of air power. From the Buna… area we have advanced along … northern shore of New Guinea to … Huon peninsula, a drive marked …cially by the brilliant Markham …ley campaign, where airborne Avi…n Engineer units had a forward …ter field ready for planes in 24 …rs.

…gineer island-hopping operations

In February, 1943, the Japanese …itted defeat on Guadalcanal, …re Army units had replaced Ma… the preceding October. In …rch, the stunningly successful vic… of the Bismarck Sea established … air authority over the entire archipelago. From Guadalcanal we moved northwest toward Rabaul—Rendova in July, New Georgia in September, Bougainville in November. In each amphibious advance, air cover and sea power enabled us to isolate the Jap garrison and prevent its reinforcement; while our own supply lines were well protected. The use of Amphibian Engineer units to maintain island-to-island supply lines was a feature of this advance through the Solomons. Engineer water points, especially the larger installations distilling sea water, were used by both army and navy units.

From the landing beaches through the jungle, roadbuilding was the primary task of the Engineer units. In this roadbuilding job, the varied usefulness of the bulldozer made it a combat weapon of the utmost significance to future jungle operations. On New Georgia, improvised armorplate shields protected Engineer drivers of the bulldozers, since Jap snipers considered them A-number-one targets. Jungle operations in 1944 will continue to be paced by Engineer bulldozers.

Alaska and the Aleutians

On the other roads to Tokyo, engineering has been equally indispensable. By May of 1943, with new airfields at Adak and Amchitka built from scratch by Engineer troops, Army flyers were bombing Attu and Kiska daily. In the brief but fierce battle for Attu in May, Engineers proved as able in combat as they had been at Milne Bay, New Guinea, the preceding year. Engineer Hill on Attu memorializes the Engineer troops who stopped the Japs' last suicide raid.

The final ousting of the Japs from the Aleutians was the culmination of the constant and tremendous work that Engineers have put into what might well be called our northern link to Asiatic Russia. The Alaska Highway, the airfields, the communication routes, the development of the oil field at Norman Wells and provision for piping and refining the oil for use at bases throughout the area, have all been part of a coordinated effort to bring America and Russia closer together by way of the North Pacific. We now have, along the great circle route from our own Great Lakes region up through Canada to Alaska, a lend-lease supply route for planes and other materials that is of incalculable importance to all future North Pacific strategy. Engineer-built bases in the Aleutians are both a shield for this supply route and a spear pointed directly at Japan's inner empire.

India and Persia supply lines

In October, first public announcement was made of the Engineer's Ledo Road project across northern Burma.

New Guinea supplied a test of Engineer stamina and ingenuity. Here Engineers direct a native labor force building a road culvert in the Dobodura area.

Engineer troops and machines—"work-power" the Army calls it—clean up the port of Naples. Similar tasks await the Engineers as other invasions hit Europe.

Almost completely overlooked in the press dispatches was the fact that the road was traversing approximately the same wild area over which General Stilwell had retreated in May of 1942. The contrast between Stilwell's bitter retreat and the steady rumble of big bulldozers carving a road back speaks volumes on the Engineer's place in the India-Burma theater. In the building of the huge Allied bases at Karachi and Calcutta, and in the air and ground supply routes from these bases toward the fronts, U. S. Engineers have helped again to clear the way.

The year's-end Cairo conference was a recognition of the fact that the basis for stripping Japan of its empire has been well engineered. Tehran was a recognition, too. It is no accident that the "Big Three" should have met in Tehran; for since the completion by Engineer troops of the new railroad on March 30, 1943, and the concurrent highway and truck transport improvements, lend-lease supplies moving to Russia by way of the Persian Gulf-Tehran-Caspian Sea route have approximately doubled in volume over the entire previous total. Stalin's toast to American production was a toast also to the engineering of the supply line, which could make the production felt in the great Russian offensive.

The part which Engineers played in the North African campaign is well known but can be re-emphasized. It was there that Amphibian Engineers got their first battle test. Engineer water supply—with desert machines often requiring more water than the men—moved without a hitch. The Chief of Staff's own report commented on the successful use of Engineer Petroleum Distribution Units to move by pipeline the enormous quantities of gasoline and oil from tankers up to the airfields and battlefront depots. More than half the dead-weight tonnage moved to the front during the campaign for Tunisia was gasoline and oil.

Moving an army across Tunisia

Engineer combat proficiency in road building and traffic control was given a dramatic demonstration in the sudden swift moving of General Patton's entire American Second Corps from the southeast corner of Tunisia to the extreme northern tip of the line —across all east-west supply roads. The subsequent punch of the American fighting units contributed directly to the quick collapse of German resistance in the Bizerte-Tunis area.

A newly devised pioneer road team organization made possible Engineer construction of the roadways across the Tunisian table lands at a rate as high as four miles an hour. Tractor-bulldozers were carried ahead on six-wheel-drive desert trucks to attack critical points such as steep-banked washouts, gullies, or bomb and shell craters. The tractor-bulldozers were followed by V-drags, pulled either by tractors or tanks at a rate as high as 12 miles an hour. These drags cleared the roadway of debris. Teams of motorized graders, following each other, finished up the job of grading and scraping the surface. To move the large bodies of troops across the east-west lines of communication without confusion, the American Engineers were equipped with portable overpasses, which could be quickly erected. The roadways were maintained continuously during the passage of the heavy traffic.

Perhaps the greatest contribution of the Engineers to our victory in North Africa, however, was the construction of more than 120 battle airdromes for the advance of our air power. The Engineer "work-power," which made such an undertaking possible, amazed our Allies as much as it confounded the Germans.

And now Italy and England

It is no secret that among our most closely-guarded secrets are the figures of tonnage-per-hour moved through our invasion ports. This port capacity sets over-all limits to all subsequent land operations. The Germans consequently attempted the most thorough job of demolition in history on the port of Naples, hoping thus to choke our striking power on the Italian peninsula. The work of our Engineers in undoing the German engineers' damage and restoring the port of Naples to significant capacities may well rank as one of the great stories of the war.

The point can not be over-emphasized that Engineer units, from squads up to regiments, are organized both for work and for combat. The steady slog of our Fifth Army up the Italian peninsula's backbone of mountains, mud, and swollen streams, like the Volturno, has put a tremendous burden on the Army's capacity for work. Bulldozers run 24 hours out of 24. Air compressors rebuild where the German explosives destroy. The Engineers realize that progress is measured by work.

And in England, Engineers, poised with one of the most powerful invasion armies in history, also realize that it is their work that will measure our advance from the west. The bombers already invading Europe rise from and return to Engineer-built airdromes. The year 1944 will also be one in which Engineers will have to work and to fight. The war is still an Engineer's war.

ARMY E NAVY

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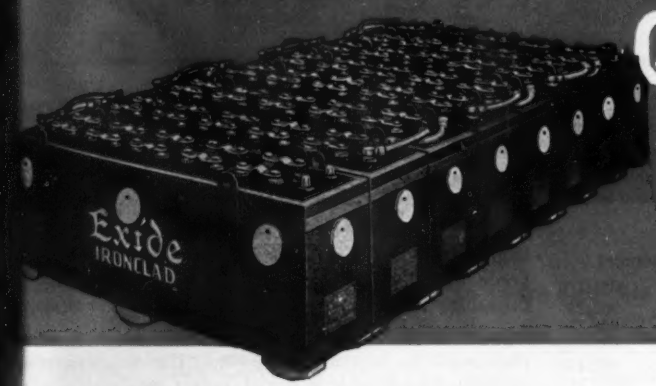

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CONTRACT UNIT PRICES

What contractors are bidding on different kinds of construction work

AIRPORT, LA CROSSE, WIS.

OWNER: Civil Aeronautics Administration, Chicago.

PROJECT: Construction of airport at La Crosse, Wis., including runway, taxiway, and concrete apron. Involves necessary clearing and grubbing, drainage structures, grading, fencing, seeding and sodding, underground cable ducts, and construction of entrance driveway. Alternates were allowed on airport paving: Alternate A, 7-in. Class A concrete pavement; and Alternate B, bituminous runway and taxiway pavement, and concrete apron. Contract awarded on basis of Alternate B.

CONDITIONS: Contractor to furnish all materials and complete all major items of construction in 150 days and all items in 180 days. Rail, highway and water transportation facilities available. Wage rates are: skilled labor, $1.25 to $1.50 per hour; semi-skilled, $1.00 to $1.25; and common labor, 90c. Contract has been awarded, but construction is not expected to begin until April or May. In connection with unit prices submitted on grading items by the low bidder, the owner states that they were below the average received recently for similar grading work in this general area.

BIDS: Twelve bids were received October 29, 1943 on Alternate B basis of construction. They range from the contract low of $925,779 to $1,273,590. Eleven bids were opened the same day on the basis of Alternate A, ranging from the low of $999,526 to $1,457,615.

LIST OF BIDDERS: (Alternate B, Bituminous Pavement.)

1. AGT Associates, Eau Claire, Wis. (contract) $925,779
2. Rock Road Constr. Co., Chicago, Ill. 962,250
3. Cheney-Wright Co., Williamston, Mich. 968,756
4. Megarry Bros., St. Cloud, Minn 987,122
5. J. Rasmussen & Sons Co., Oshkosh, Wis 988,443
6. Okes Constr. Co., St. Paul, Minn 1,052,229
7. Frank Mashuda Co., Milwaukee, Wis 1,075,015
8. S. J. Groves & Sons Co., Minneapolis, Minn 1,076,761
9. Jay W. Craig Co., Minneapolis, Minn 1,092,513
10. Tobin Quarries, Inc., Kansas City, Mo 1,155,586
11. Concrete Material Constr. Co., Cedar Rapids, Iowa 1,230,463
12. M. J. Boyle & Co., Chicago, Ill. 1,273,590

Preparation of Site

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clear, grub within grading limits and safety zones	Lump Sum	$10,000.00	$25,000.00	$4,500.00
2. Clearing brush in clearing zones	Lump Sum	5,000.00	1,600.00	1,000.00
3. Clearing trees outside grading limits, safety and clearing zones	2,200 in dia.	.30	.50	.80
4. Grubbing stumps outside grading and safety limits	500 in. dia.	.40	.40	.20
5. Cleaning homestead sites (16 sites)	Lump Sum	1,600.00	2,300.00	4,800.00
6. Fence removal outside grading limits and safety zones	1,000 rod	.50	.55	.30
7. Grading	1,341,000 c. y.	.22	.21	.22
8. 24-in. (C-76) ext. str. storm sewers	406 l. f.	3.75	5.00	5.00
9. As above, bedded in concrete	466 l. f.	5.25	6.00	6.50
10. Concrete for sewer inlets, headwalls, etc.	14 c. y.	30.00	40.00	25.00
11. Dry wells	37 ea.	100.00	115.00	125.00
12. Reinf. steel for drainage struct.	1,700 lb.	.15	.10	.10
13. 30-in. concrete grate bars	367 ea.	2.00	2.10	2.00
14. Smoothing field areas outside grading limits	20 ac.	25.00	11.00	25.00
15. Fertilizing	520 ac.	10.00	16.00	12.00
16. Liming	520 ac.	9.00	7.00	11.00
17. Seeding, winter rye	520 ac.	3.00	7.00	5.00
18. Grass seed mixture	520 ac.	9.00	15.00	15.00
19. Sodding	1,430 s. y.	.60	.40	.40
20. 3-in. undergrd. cable ducts, one duct bank	4,120 l. f.	1.00	1.25	1.25
21. As above, two duct bank	1,120 l. f.	1.75	2.00	2.00
22. As above, three duct bank	600 l. f.	3.00	2.50	
23. As above, four duct bank	110 l. f.	5.00	3.50	
24. Fencing, Class C	1,150 rod	2.80	4.00	
25. Cr. stone surf., entr. driveway	5,900 s. y.	.60	.60	
26. Prime coat, MC-1, entr. driveway	2,350 gal.	.15	.11	

Paving—Alternate "A", Concrete Pavement

27. 7-in. Cl. A concrete pavement	335,650 s. y.	1.92	

Paving—Alternate "B", Bituminous Runway and Taxiway Pavement and Concrete Apron

28. 6-in. aggregate sub-base course	328,500 s. y.	.60	.63
29. 4-in. waterbound macad. base crse.	327,000 s. y.	.47	.47
30. MC-1 prime coat, base crse.	131,000 gal.	.10	.11
31. 2-in. central plant, hot mix, bit. surf. course	29,600 ton	3.50	3.50
32. 3-in., as above	7,000 ton	3.50	3.85
33. Asphalt cement, 120–150 pen.	496,000 gal.	.08	.10
34. RC-2 seal coat, surf. crse.	82,000 gal.	.11	.12
35. Seal coat aggregate, surf. course	3,250 ton	3.00	2.50
36. 7-in. Cl. A conc. pavement, apron	10,130 s. y.	2.00	2.25

HIGHWAY IMPROVEMENT, OREGON

OWNER: Oregon State Highway Dept., Salem, Ore.; Paul Van Scoy, division engr.

PROJECT: Grade widening, surfacing and oiling Jordan Creek-Scotts Butte Creek section of Idaho-Oregon-Nevada Highway in Malheur County, Ore. Includes 12.82 miles of grade widening; 34.56 miles of surfacing and oiling; and furnishing 9,400 cu.yd. of crushed material in stockpiles.

CONDITIONS: Contractor to furnish all materials and complete work by September 30, 1944. Highway transportation facilities are available to site of project. Minimum wages are skilled labor, $1.20 per hour; semi-skilled, 75 to 90c; and common, 62½c.

BIDS: Six bids were received December 23, 1943, ranging from the contract low of $385,937 to $533,468.

LIST OF BIDDERS:

1. Rogers Constr. Co., Dayton, Wash. (contract) $385,937
2. E. C. Hall Co. and J. C. Compton, Eugene and McMinnville, Ore. 405,6
3. McNutt Bros., Eugene, Ore 438,2
4. E. P. Bishop, Orland, Calif 495,0
5. Morrison-Knudsen Co., Inc., Boise, Idaho 511,9
6. Babler Bros., Portland, Ore 533,4

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing and grubbing	Lump Sum	$2,000.00	$4,000.00	$1,0
2. Trench excavation, unclassified	100 c. y.	2.00	2.00	
3. General excavation, unclassified	40,000 c. y.	.50	.50	
4. Truck haul	7,000 y. mi.	.20	.20	
5. Finishing road bed and slopes	18 mi.	400.00	300.00	30
6. 18-in. sewer pipe	320 l. f.	2.75	3.00	
7. 24-in. sewer pipe	20 l. f.	4.00	5.00	
8. 36-in. sewer pipe	10 l. f.	8.00	10.00	1
9. Selected roadbed topping	120,000 c. y.	.40	.45	
10. Hauling roadbed topping	260,000 y. mi.	.12	.14	
11. Stripping topping mat'l. pits	30,000 c. y.	.25	.20	
12. 1½-in. to 0-in. crushed gravel in base	38,500 c. y.	1.60	2.00	
13. ¼-in. crushed material in shoulders	2,300 c. y.	1.90	2.25	
14. Sprinkling	4,000 M gal.	2.00	2.00	
15. Preparation of base	34.56 mi.	200.00	150.00	2
16. Furnish and place aggregates	22,700 c. y.	3.95	3.50	
17. Furn. and place 151–200 pen. asph.	1,810 ton	37.00	40.00	3
18. RC-3 or emulsified asphalt	430 ton	38.00	40.00	3
19. ¼-in.–¾-in. cr. mat'l (stockpile)	4,200 c. y.	2.60	2.50	
20. As above, ¾ to 1-in.	2,800 c. y.	2.60	2.50	
21. Cr. mat'l. in stockpile, under ¼-in.	2,400 c. y.	2.60	2.50	
22. Clear and grub stockpile sites	Lump Sum	100.00	500.00	6
23. Leveling stockpile sites	Lump Sum	100.00	800.00	8

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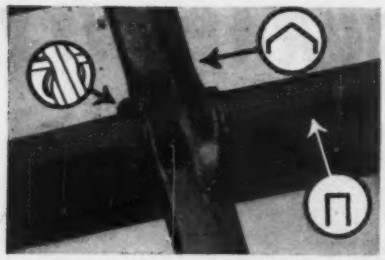

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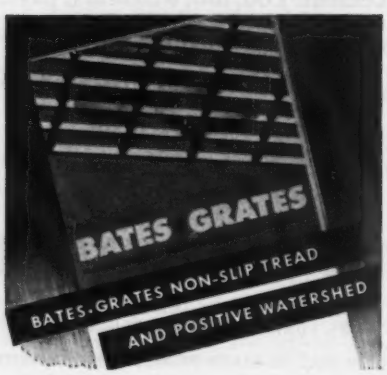


NEW AIDS TO THE CONSTRUCTOR

New Slide Rules

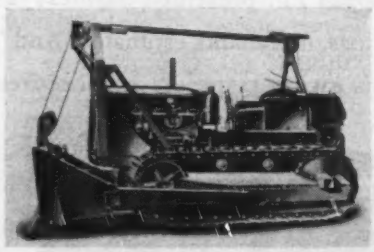
Produced as an emergency measure to meet tremendous demand, three new slide rules have just been made available, one for the professional draftsman, one for the apprentice draftsman or student, and one in handy 5-in. pocket size. All three rules contain the scales A, B, C, D, CI, K, S, L and T. The apprentice rule has a painted face; the other two are celluloid.

Said to be very well constructed and accurate, these slide rules come equipped with a case and a complete instruction sheet.—*The Frederick Post Co., Box 803, Chicago 90, Ill.*

• • •

New Dozer

As part of the manufacturer's post-war program, a new dozer, with a blade that may be tilted in four positions—16 in. up or down at either end of the blade, and 3¼ in. forward or backward at top and bottom—can also be held in straight bulldozing position. The blade, it is claimed, can be raised 45 in.



above the ground line, and dropped 6 ft. below ground level.

This earth-moving unit, called "Adjustadozer," is cable-operated, and features backward and forward tilting of the blade, adjusted through a screw jack mechanism operated by a ratchet lever. Regulating gages indicate blade position, and eliminate guesswork. The dozer frame is of heavy, electrically welded box channels, reinforced with box-type steel plates. The blade, of welded box plates of high tensile steel, has a moldboard designed with proper curvature for digging and rolling material; the cutting edge is made of three pieces, with the center section reversible, and the end sections hard-faced and replaceable. The unit is designed for mounting on Caterpillar D-7 tractor.—*LaPlant-Choate Mfg. Co., Inc., Cedar Rapids, Iowa.*

• • •

Goggle Cleaning Cabinet

A cabinet to encourage workmen to wear their goggles and keep them clean has been developed. Compact in size, it is equipped with a lens-cleaning and anti-fogging agent, called Fogpruf, and optical wiping tissues. The unit, which

may be mounted in work and locker rooms, has a sliding panel to permit replacement of the Fogpruf and tissues. A padlock is attached to prevent theft.

Two vials of the fluid are concealed within the dispensing block, to clean two pairs of goggles at one time, and a tap on either button sprays it on the lens. The tissues are pulled from the top of the dispenser.—*Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh 8, Pa.*

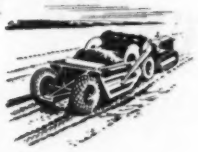
• • •

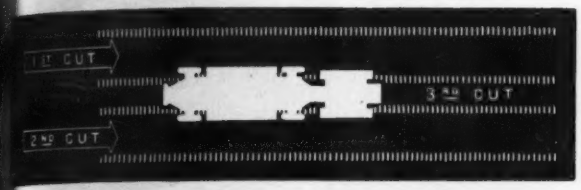
Semi-Photographic Printer

Designed for speed, ease and simplicity of operation, the new Bruning 55C continuous photographic printer is said to provide clear duplicates of anything typed, printed, photographed or drawn. This 42-in. printer, requiring floor space of only 40x62 in., may be used inside or outside of the dark room, and operates either with roll stock or cut sheets.

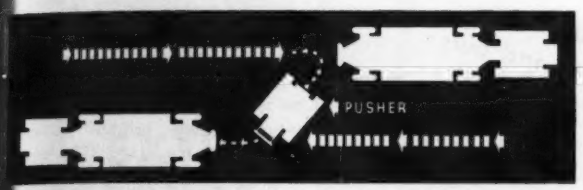
Here's the cheapest, best way to

STRIP TOP SOIL





One way to get bigger heaped loads with less power is to leave a ridge about ½ the width of the cutting edge between successive cuts. Then straddle this ridge on the next trip through, thus pushing a thick slice of material into the center of the scraper.



In loading with a pusher tractor in short pits, it sometimes pays to load in opposite directions and schedule your operations so that the instant your pusher finishes loading one scraper, it can swing around and start loading another. This saves pusher turning and waiting time.

Experienced operators agree that nothing else compares with a tractor-drawn scraper when it comes to removing top soil from large, open areas. This is because a scraper can strip off as much (or as little) top soil as necessary . . . haul it away and stock pile it . . . pick it up later and spread it in smooth, even layers for seeding. Saves time and money, gives you a better finished job and enables you to release less adaptable equipment for other work. To help keep your present LaPlant-Choate equipment in "fighting trim," see your LaPlant-Choate "Caterpillar" distributor—for useful operating ideas, for reliable parts and service. LaPlant-Choate Manufacturing Co., Inc., Cedar Rapids, Iowa.

WHAT'S COMING?

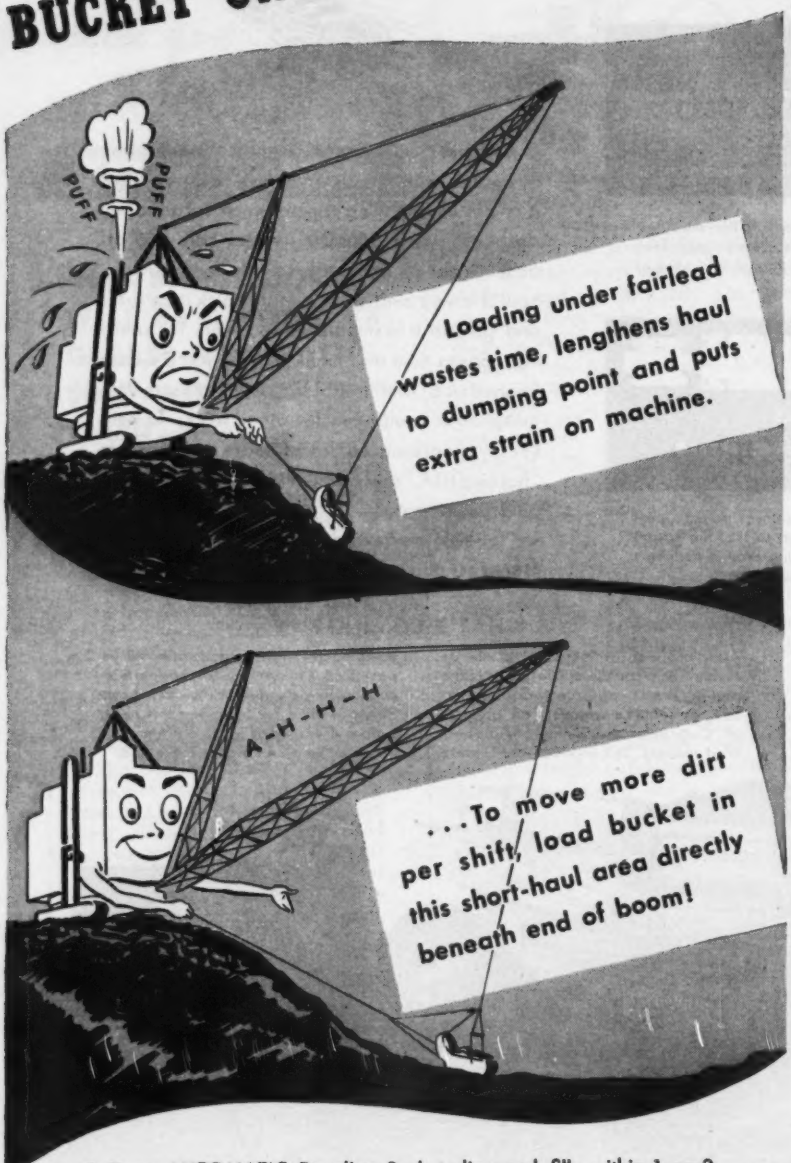
After the war LaPlant-Choate will be ready with a complete new line of cable and hydraulic operated dozers and scrapers—built exclusively for all sizes of "Caterpillar" track-type and rubber-tired tractors. This new LaPlant-Choate equipment—much of it developed especially for the armed forces and thoroughly proved under the most trying conditions—will offer improvements never before dreamed of in the earth-moving industry. So plan now for the future.

LaPLANT-CHOATE

Earthmoving and Land Clearing Equipment

DRAGLINE PRODUCTION TIP NO. 1

DON'T LOAD THE BUCKET UNDER THE FAIRLEAD!


PUFF
PUFF
Loading under fairlead wastes time, lengthens haul to dumping point and puts extra strain on machine.
A-H-H-H
...To move more dirt per shift, load bucket in this short-haul area directly beneath end of boom!

A Page AUTOMATIC Dragline Bucket digs and fills within 1 or 2 bucket lengths . . . no need to drag it in close to get a full load. Size for size and weight for weight, a Page AUTOMATIC will outdig any other dragline bucket made!

PAGE *Automatic* DRAGLINE BUCKETS

PAGE ENGINEERING COMPANY, CHICAGO 38, ILLINOIS

Model 55C, with a speed of 0 to 18 it. per minute, has one white and one amber fluorescent tube, and the printing light is sealed for darkroom use. The

variable speed transmission is driven by a constant speed motor. Good contact to prevent slippage has been provided, as well as a large print return tray. The machine is mounted on casters and has a two-tone green crinkle finish.—*Charles Bruning Co., Inc., 4700 Montrose Ave., Chicago, Ill.*

• • •

New Resins

Coating of fabrics, paper, foil and other materials, wire insulation, film for packaging, and manufacture of extruded and molded products are among the principal fields of the new "Geon" resins, according to the manufacturer's announcement. Two of the resins, "Geon 202" and "Geon 203", are entirely new vinyl chloride; vinylidene chloride copolymers.

The new Geon 200 series was created to meet the need for polyvinyls which combine solubility and thermoplasticity with stability, chemical resistance and wide temperature range. Compositions varying from a rigid thermoplastic to a very soft jelly can be obtained by modi-

DRILLING CONTRACTORS

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DIAMOND & SHOT CORE DRILLING
LOAD TESTS—TEST PITS

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THE GILES DRILLING CORPORATION
18 East 48th Street New York, N. Y.

THIS is a dirt-moving war . . . *a tractor war*. Already the history of World War II is brimful of heroic jobs done by crawler tractors, equipped with bullgraders, bulldozers and scrapers. Those tractors will continue to smash their way through jungle and swamp, over mountain and plain, to Victory.

As a two-star general of the Army Engineers puts it: "Victory seems to favor the side with *the greatest ability to move dirt.*"

Munda . . . Rendova . . . the Solomons . . . Kiska . . . Sicily . . . Salerno . . . everywhere our fighting forces go, you'll find these armored giants building roads, smoothing shell-torn landing fields, pulling heavy guns, handling aircraft bombs.

The Armed Forces have first call on International TracTracTors today. That's why so few new ones are available for civilian use. The new TracTracTors you need so much today, to replace badly worn equipment, are more urgently needed on the fighting fronts.

Many of your old Internationals have a lot of work-hours left in them. Keep those tractors well serviced. Work closely with your International Industrial dealer. He has the skilled service men, the well-equipped shop, and the stock of International Parts to help keep your TracTracTors plugging on the home front, backing up the military TracTracTors on the battle front.

INTERNATIONAL HARVESTER COMPANY

180 North Michigan Avenue — Chicago 1, Illinois

INTERNATIONAL POWER

EASY does it

On All Concrete Sections

VIBER Concrete Vibrators

Viber "Viberation" equipment is powerful, rugged, fast . . . *but EASY to carry and handle!* Your operator can work all day long at top speed and efficiency with a Viber Vibrator. Viber's portability means less strain, less fatigue—*more production, lower cost.* Viber offers other exclusive features. Keep ahead of schedule with Viber!

WRITE for our latest catalog describing all the new Viber developments

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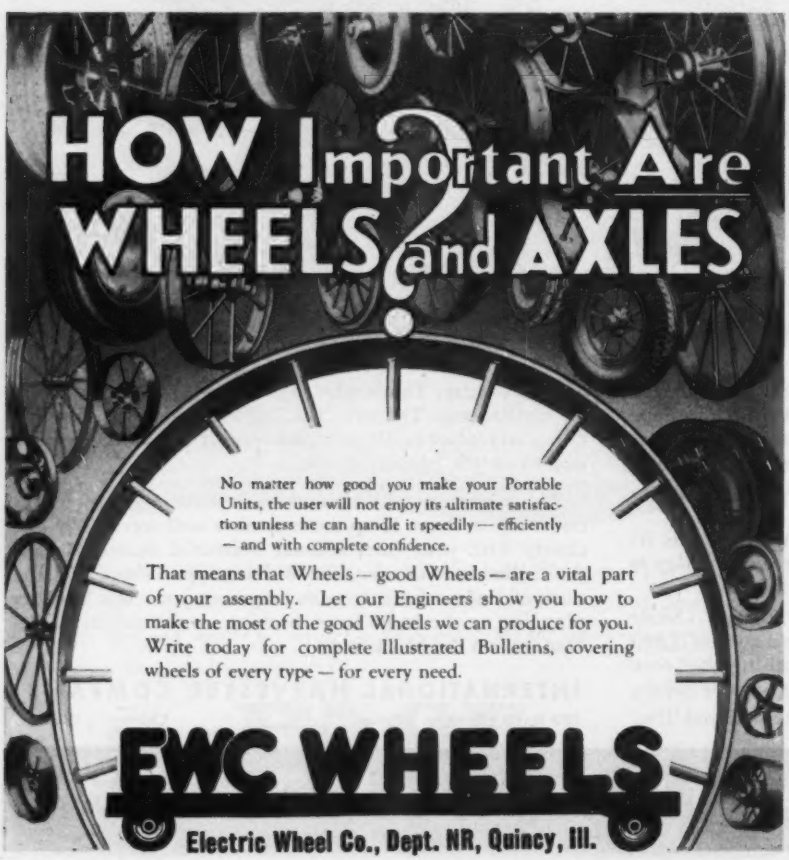
HOW Important Are
WHEELS and AXLES?
No matter how good you make your Portable Units, the user will not enjoy its ultimate satisfaction unless he can handle it speedily — efficiently — and with complete confidence.
That means that Wheels — good Wheels — are a vital part of your assembly. Let our Engineers show you how to make the most of the good Wheels we can produce for you. Write today for complete Illustrated Bulletins, covering wheels of every type — for every need.
EWC WHEELS
Electric Wheel Co., Dept. NR, Quincy, Ill.

fying the "Geon" resins with other compounding materials.

Purchases of these resins are subject to allocation by the War Production Board under General Preference Order M-10. Reasonable quantities, however, are available for experimental purposes. —*Chemical Division, B. F. Goodrich Co., Akron, Ohio.*

• • •

Plastic Safety Goggles

Flattering in appearance and extremely light in weight, new "Eye Saver" industrial goggles are also said to be of rugged construction. The one-

piece lens is of shatterproof methacrylate, which will withstand heavy impact and is resistant to pitting caused by sparks.

The curved plastic frame fits the face snugly and comfortably, it is claimed, and shields the eyes from every angle. The frame is reinforced with a high-brass clip at the nose bridge. Easy replacement of the low-cost non-fogging lens is possible.—*Watchemoket Optical Co., Inc., Providence 3, R. I.*

• • •

Waterproof Liquid

Great flexibility and strength are claimed for a new waterproof liquid "Seallock," to be painted or sprayed on any kind of surface. According to the manufacturer's statement, a single coat of the liquid, drying in two hours, leaves a film less than 2/1000ths of an inch thick, with a tensile strength of over 100 lb. per sq.in. No water or oil can penetrate this film, nor is it affected by heat or cold.

While "Seallock" in itself is somewhat inflammable, it ceases to be after application. It must be applied to a dry

in structural welding

IS OUR BACKGROUND FOR FUTURE SERVICE

STRUCTURAL welding has a comparatively short history—but it is crammed with accomplishment. From the simple experimental beam seat weldments of the early "Twenties" is a far cry indeed to the intricate completely welded LST's — Landing Ship, Tanks — that slide down our launching ways today. Nothing better illustrates the giant strides welding has made in speeding up, simplifying, and in reducing the weight of structural fabrication.

As one of the pioneers in the application of welding to fabricated steel structures, American Bridge Company has played a leading part in the research and experimentation on which today's methods and techniques are based.

The war has merely intensified and accelerated our activities. With increased production a paramount imperative, seconded by the vital need to conserve steel, structural welding, and our contribution to its successful application, has advanced by leaps and bounds.

In solving the problems of new and unusual welding applications, in developing new techniques to meet the special requirements of the war-time steels, in overcoming the difficulties presented by intricate and bulky weldments of exacting tolerances, American Bridge Company technicians and shop personnel have met every challenge.

Our welding facilities have been doubled and redoubled. Our technical research has been broadened. More efficient methods have been constantly developed. Shop forces have been intensively trained to new skills.

It is this wealth of technical knowledge and wide practical experience, supplemented by equipment and facilities second to none, that stands ready to help you in your post-war construction program. Welding will have a large part in it—and we know welding.

AMERICAN BRIDGE COMPANY

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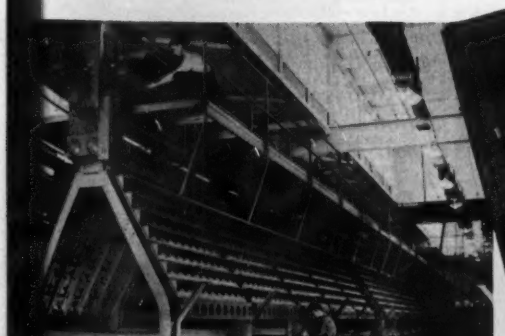
District Offices in: Baltimore · Boston · Chicago · Cincinnati · Cleveland
Denver · Detroit · Duluth · Minneapolis · New York · Philadelphia · St. Louis

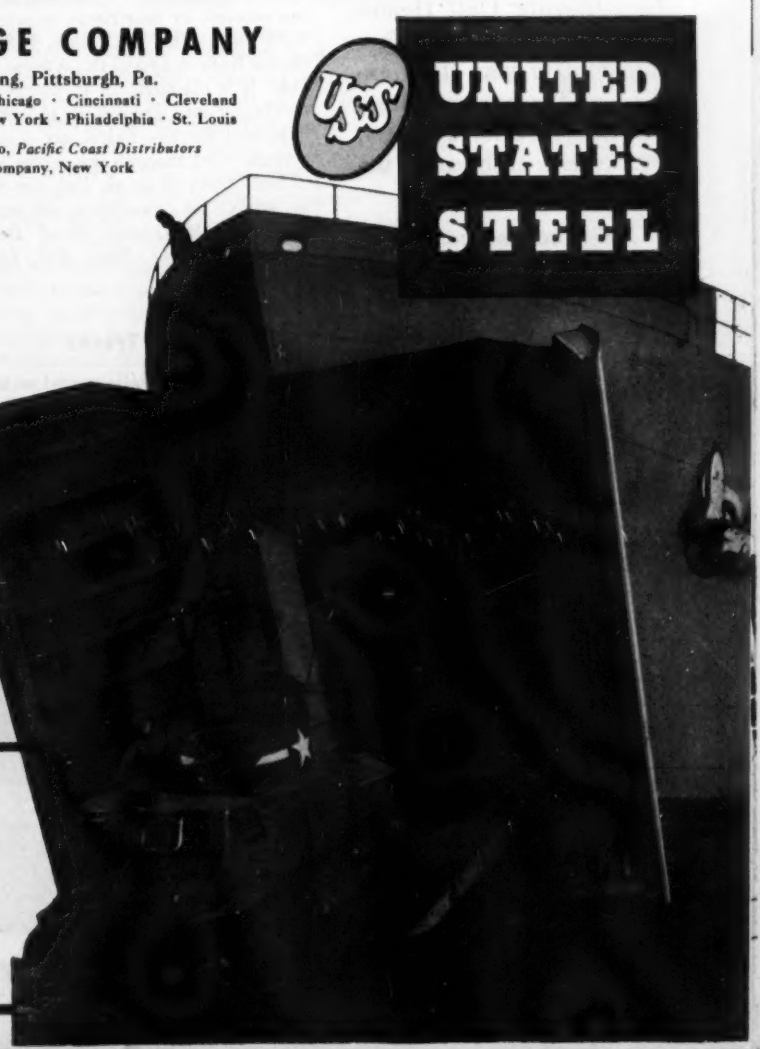
Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
United States Steel Export Company, New York

These all-welded machine frames for continuous rayon spinning units resulted in marked advantages and economies. These units required skilled workmanship of the highest order to assure rigidity and perfect alignment of hundreds of rotating reels, long line shafting and bevel gears in which it was necessary to hold tolerances to .001".



And now — Landing Ship, Tanks

Born of American ingenuity, these all-welded "ugly ducklings" are one of the most startling types of ship the war has produced. Ships like this have been in production at one of our inland yards for many months. Many have already served their country well in establishing vital bridge-heads overseas. (Official U. S. Navy Photograph.)



PUTTING THE "OK" ON YOUR REZNOR UNIT HEATER . . .

Each Reznor Unit Heater must stand inspection before shipment to you. This experienced workman, a Reznor employee for 24 years, checks over each part of the product.

Here he has connected the heater to a gas line and is applying a flame to make certain there are no leaks. In turn he will test the wiring, the valves, the controls, the pressure regulator, and all of the other parts.

When you buy a Reznor Unit Heater, you purchase a quality product that will deliver an even flow of heat where you want it, when you want it.

REZNOR

REZNOR MFG. CO.

105 James St., Mercer, Pa.

GAS HEATERS EXCLUSIVELY SINCE 1888

surface, in order to penetrate and seal all pores.—*The Seallock Co., White Plains, N. Y.*

• • •

Repair Links

Contributing to the life and performance of dragline bucket chain, two new patented closing or repair links are now available. Clark link M-91 is designed for large chain with 1¼ to 2½ in. sections; its halves, with interlocking lugs,

are secured by four rivets to produce a tight joint. The "J-C" link, R-890, for chains from ⅞ to 1⅛ in., is more adaptable, it is claimed. In it, tapered ends fit closely into grooves in the opposite half, and the two halves are joined by a single rivet through the center lugs.

Both types of repair link are carried in stock for immediate shipment.—*American Manganese Steel Division, American Brake Shoe Co., Chicago Heights, Ill.*

• • •

Lift Trucks

Said to be specially useful in narrow aisles and crowded factory quarters, the new Hyster "20" lift truck has a 66-in. turning radius. The pneumatic tires

with which the truck is equipped greatly increase the operating speed, it is claimed, and provide good traction for going up ramps, etc., as well as reducing injury to the floor.

Here Is Your Nearest Worthington Distributor

For Sales, Rentals and Service on BLUE BRUTE Portable Compressors, Rock Drills and Air Tools.

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Get more WORTH from air with WORTHINGTON

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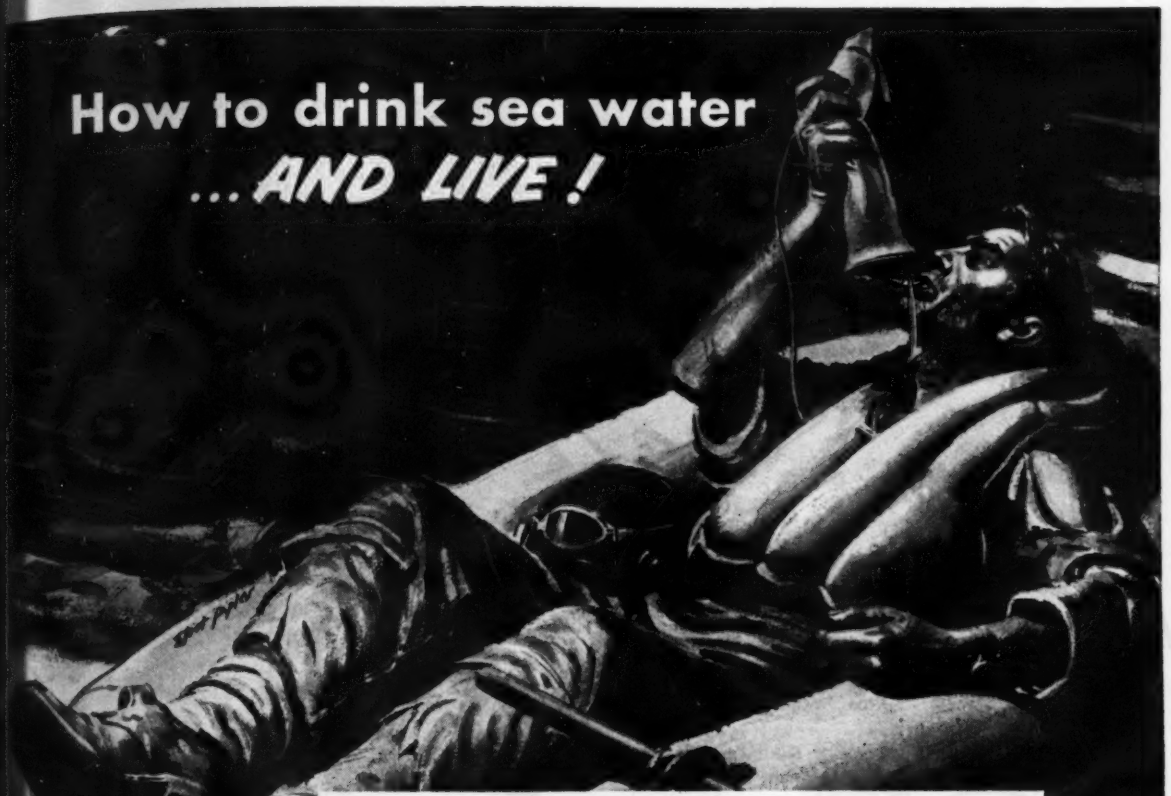
How to drink sea water ...AND LIVE!



FORCED down at sea, this pilot will live to fly and fight again, because thirst—age-old enemy of shipwrecked men—has been conquered. Now he can drink sea water!

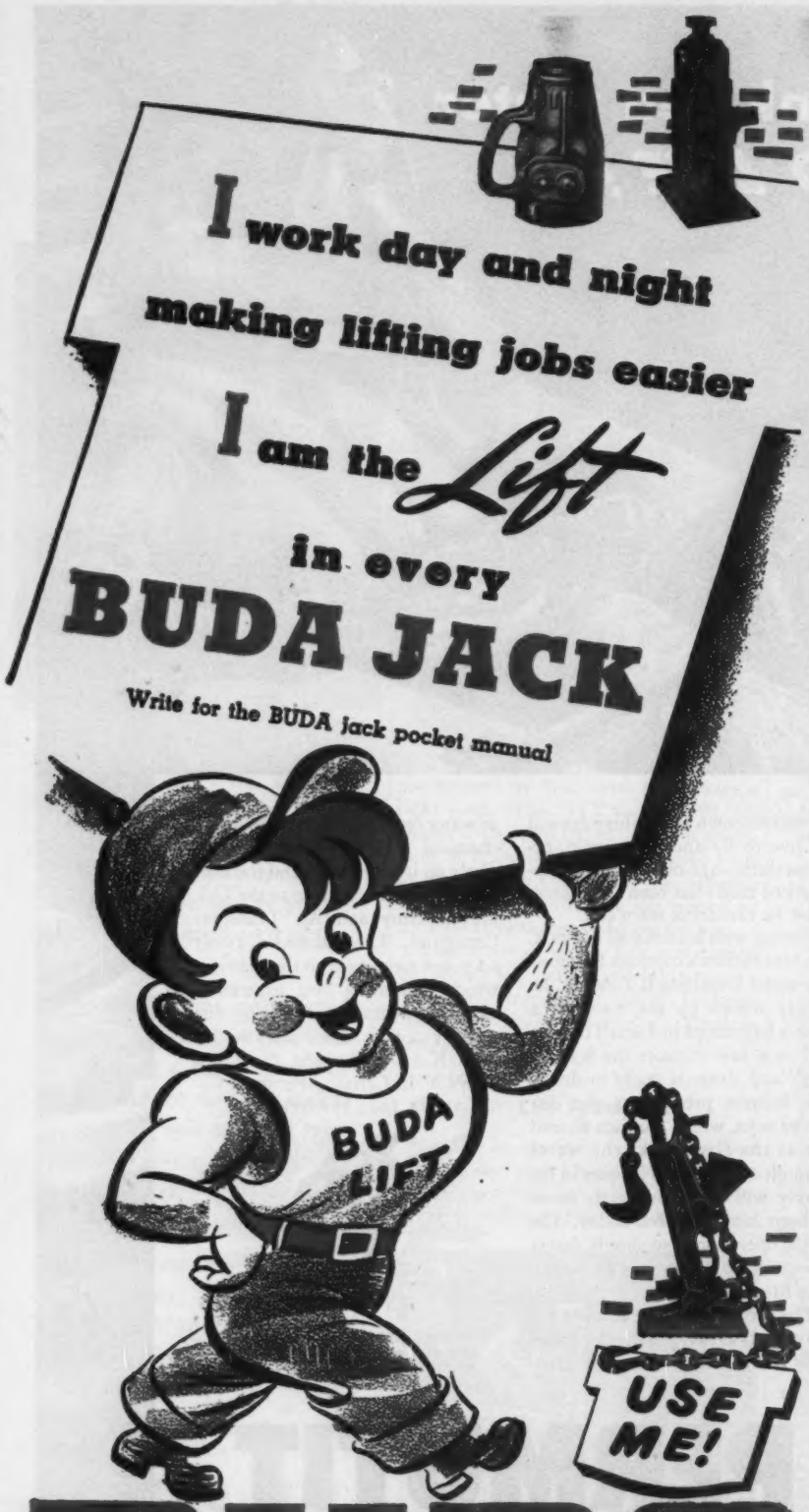
Packed with his deflated life-raft, the flyer carries a compact Permutit Sea-water Desalting Kit. Adrift, he simply scoops up sea water in a plastic bag, drops in a small briquet and in a few minutes the water—fresh and clear—is ready to drink. The briquet precipitates the dissolved salts, which are then filtered out as the flyer sucks the water through a tube. Each briquet in his supply will freshen enough water to keep him alive for a day. The whole operation is so simple that it can easily be carried out by a man on a life-raft.

The problem of developing a practical de-salting method was early recognized by Permutit. Here at water conditioning headquarters, chemical engineers worked intensively on it for months and the final product was acceptable to the U.S. Navy, Army and Air Transport Command. The successful result adds one more field to the many in which Permutit's long experience in water treatment is serving our country at war. The Permutit Co., Dept. K, 330 W. 42nd St., New York 18, N.Y. In Canada: Permutit Co. of Canada, Ltd., Montreal.

The Permutit Sea-water Desalting Kit occupies only one-tenth the space of the drinking water it produces.

PERMUTIT

WATER CONDITIONING HEADQUARTERS

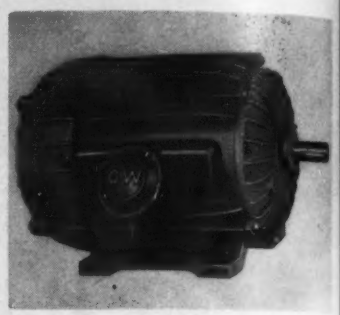


This lift truck is a gasoline powered fork type unit, with 25 hp. 4-cylinder V-type motor with spark arresting mufflers.—*Willamette Hyster Co., Portland 8, Ore.*

• • •

Sealed Motor

Severe laboratory tests given to its new "Sealedpower" motor, according to the manufacturer's announcement, have proved the effectiveness of the sealing against moisture, fumes, vapor and dust.



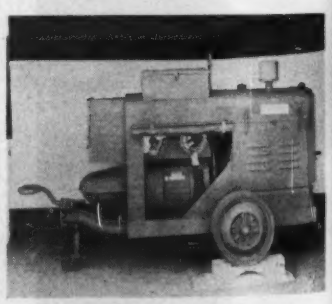
This motor is totally enclosed and fan-cooled, without cooling ducts. All exposed parts are said to be highly acid and alkali resistant. Each coil is also individually sealed.

The motor, in sizes from 1 to 15 hp., can be furnished for operation from any polyphase power supply.—*Crocker-Wheeler Division, Joshua Hendy Iron Works, Ampere, N. J.*

• • •

Portable Welders

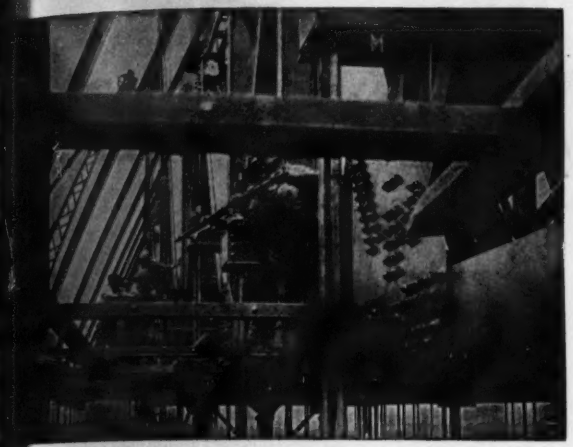
Portable and gasoline-driven, the new Model LWL welding machine is made up of a Waukesha Model FCU gasoline motor, driving a 200-ampere Lincoln "Shield Arc" welding generator. This



unit with tool boxes is mounted on a welded structural shape chassis with rubber tires and towing attachment; the whole may be easily moved by hand, it is claimed. A lifting hook is also provided.

The machine base has an overall length of 72 in., and is 22½ in. wide. The total weight is approximately 1,500 lb.—*Libby Welding Co., 2700 East 15th St., Kansas City, 1, Mo.*

HIGH UP



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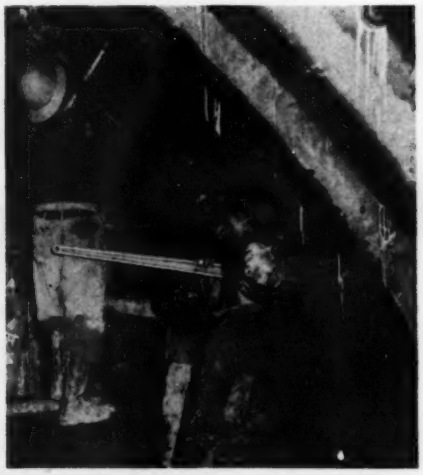


LOW DOWN

LOWELL WRENCHES

GIVE SERVICE THAT SATISFIES

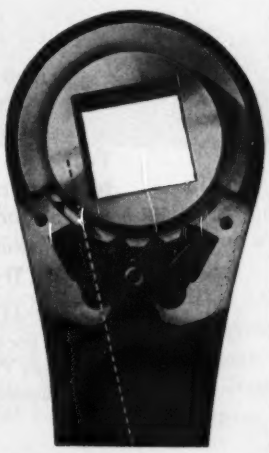
You can take it for granted that new and veteran Lowells are busy on War construction. The thing to remember for *now*—and for after the War—is the fact that *a Lowell lasts for years.* Every Lowell is a husky, simple tool that speeds work, saves effort, gets the job done *right.*

LOWELL REVERSIBLE RATCHET WRENCHES

are made in a wide variety of types and sizes, both hex and square, suited to many kinds of heavy construction erecting and maintenance work.

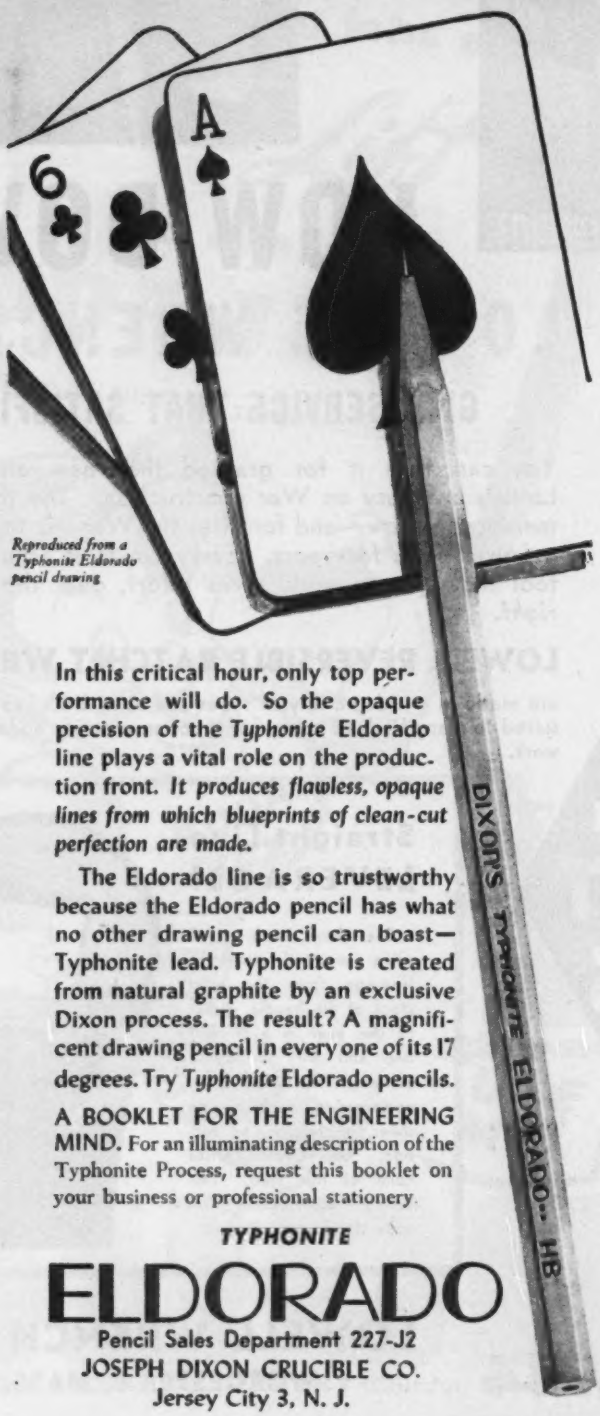
Straight Line LEVERAGE!

See how each pawl, when engaged, transmits leverage from the solid stock of the handle, direct to the gear in a *straight line* and with a square contact. The pawl is in compression only — no shear, no tension, no torsion. The shipper carries none of the load. This strong construction insures steady service.



LOWELL WRENCH CO.
WORCESTER 8, MASS.

"TOPS" LIKE the ACE of SPADES



Reproduced from a Typhonite Eldorado pencil drawing

In this critical hour, only top performance will do. So the opaque precision of the *Typhonite* Eldorado line plays a vital role on the production front. *It produces flawless, opaque lines from which blueprints of clean-cut perfection are made.*

The Eldorado line is so trustworthy because the Eldorado pencil has what no other drawing pencil can boast—Typhonite lead. Typhonite is created from natural graphite by an exclusive Dixon process. The result? A magnificent drawing pencil in every one of its 17 degrees. Try *Typhonite* Eldorado pencils.

A BOOKLET FOR THE ENGINEERING MIND. For an illuminating description of the Typhonite Process, request this booklet on your business or professional stationery.

TYPHONITE

ELDORADO

Pencil Sales Department 227-J2
JOSEPH DIXON CRUCIBLE CO.
Jersey City 3, N. J.

NEW TRADE PUBLICATIONS

Sewage Disposal—The problems of sewage disposal for small, medium and large plants, and their solution is well presented in this excellent folder.—*Sewage Equipment Division, Chicago Pump Co., 2300 Wolfram St., Chicago, Ill.*

Postwar Roads and Jobs—This is the fourth printing of the ARBA's postwar highway construction plan.

Greater emphasis has been placed on the fact that highway construction is the vitalizer of business in general. A section has been added on highway needs summing up all important factual matter obtainable, and a revised section on finance and legislation which reviews the various financing methods, and concludes with legislative recommendations, federal and state.

Since the original publication of the proposal last February a great deal of favorable comment has been received, not only from the highway industry and profession but from legislators and other groups concerned with postwar problems.—*American Road Builders Assn., International Bldg., Washington, D. C.*

Packing—A helpful guide for the selection of packing is contained in a bulletin which tabulates alphabetically over three dozen different fluids handled in process work and general plant service and lists the correct packing for each liquid, gas and vapor. An additional tabulation describes the form and construction of each packing and lists typical kinds of equipment for which each one is suited. Tables of sizes and weights are also included.—*Greene, Tweed & Co., Bronx Blvd. at 238th St., New York 66, N. Y.*

Form Engineering—Heavy form work on dams and wide wall construction is illustrated on pages 32 to 37 of the 60-page catalog. Miscellaneous form hardware and clamp reconditioning tips and dies as well as column clamps and hod guns for grouting holes is shown on page 40. Methods of using screeds and reinforcing slab construction is illustrated on page 41. Important construction data and tables are illustrated on pages 51 to 57 and 63. This is only

A SOCK ON THE NOSE!

Shallow cover over 66-inch ARMCO Asbestos-Bonded Pipe under taxiway on a southwestern bomber base. A similar line extends under the main runway.

it your problem to provide adequate airport drainage der shallow cover? If so, here's a ready answer. Flexible RMCO Corrugated Pipe (plain or perforated) has proved ility to resist crushing, cracking or disjointing under e impact and weight of heavy loads.

This means freedom from failure. You have continued urance of a firm, dry field with uniform support for nways or direct wheel loads. Operations are safer and acticable the year around. Even the effects of a heavy rm are but short-lasting.

ARMCO Pipe is also shatterproof — an important point case the field becomes a military objective. Unskilled labor can easily make the installation, using long lengths joined together with sturdy band couplers. Shifting soils and severe frost action are no hazards.

Consider ARMCO Corrugated Pipe when you are planning essential postwar airports. Ask your local ARMCO man to show you the Manual of Airport Drainage, or write to us direct regarding specific problems. Armco Drainage Products Assn., 105 Curtis St., Middletown, O.

ARMCO ARMCO **CORRUGATED PIPE**

So that's one of these bigger pay loads the crane man swears by!
HAISS Hi-Power Digging Buckets in one recent, competitive test showed 40% better efficiency than the next best—due largely to superior design of its closing gear. It pays to say "Haiss"
HAISS
DIGGING BUCKETS

GEORGE HAISS MANUFACTURING CO., INC., 140th St. & Rider Ave., New York 51, N.Y.

Bucket agencies throughout the country Write, wire for prices, delivery or catalogs.

★★ Immediate delivery on Gasoline Powered 1½ H.P., and wheelbarrow or round base mounted 3 H.P. units on suitable priority.

•

Easily Carried By One Man

•

1½ H.P. GASOLINE POWERED UNIT

• Hand puddling methods are no match for this all-purpose, 9-job MALL Vibrator that will place a stiffer mix faster with important savings in cement, sand, water, and labor. MALL Vibrated concrete assures a better bond with reinforcement; it is free from honey combs and voids; it permits an earlier stripping of forms and makes a stronger, watertight job.

8 other quickly interchangeable tools, for Concrete Surfacing, Pumping, Sanding, Wire Brushing, Sawing with Circular Saw, Drilling, Grinding and Sharpening Tools—make this easily portable unit easy to keep busy.

Full information mailed upon request.

Back the Attack—Buy War Bonds

MALL TOOL COMPANY

7730 SOUTH CHICAGO AVE., CHICAGO 19, ILLINOIS

Offices and Distributors in Principal Cities

a small part of the valuable information in this large book.—*William Forn Engineering Corp., P. O. Box 925, Madison Square Sta., Grand Rapids, Mich.*

Care of Wire Rope—With a tabbed index and contents of each section printed on each index, plus a general index, this new wire rope buyer's guide replaces all previous editions, the manufacturer says.

The 60 pages contain helpful information on conservation and care of wire rope. The booklet contains the latest tables and information in accordance with new, simplified practice on wire rope.

A copy may be obtained by writing a request on your company letterhead. —*Macwhyte Co., Jessel S. Whyte, President, Kenosha, Wis.*

Portable Generator Plants—A new 40-page engineering manual containing essential information on portable gas-electric generator plants has just been published. It explains: power factor; load factor; mixed loads; power calculations and other vital data. It is profusely illustrated with photographs, drawings, diagrams and tables. In addition there are construction views and complete specifications of 19 portable gas-electric generating plants with information on accessories and other equipment. It is printed in colors with large type and indexed for quick reference.—*Master Vibrator Company, Dayton, 1, Ohio.*

Bulldozer and Gradebuilder—A recently published condensed catalog shows hydraulic bulldozers and gradebuilders as standardized on a wartime basis. This manufacturer's hydraulic bulldozers, prior to the war, were available with two types of moldboards for each model of tractor—a boxed and moldboard for excavating work, and the regular high moldboard type for leveling, spreading, piling, backfilling and other earth-moving jobs. These two types have been combined in a single moldboard. A broader range of application is thus embodied in one unit.—*The Baker Mfg. Co., Springfield, Ill.*

Manganese Steel—Harnessing rivers with massive dams—holding back the sea with rugged jetties—dredging channels and harbors to improve navigation —building aqueducts that cities may drink—boring tunnels— digging canals —these are only a few of the colorful jobs that go to make up the construction industry.

Something of the romance of construction has been captured in this 32-page illustrated bulletin just issued. Manganese steel plays an important part in construction projects for dredging, hauling, digging, loading and other

perations. If chains, sheaves, wheels, shovel buckets, dipper teeth, crawlers, pumps and a thousand-and-one other parts for construction equipment cannot deliver service without frequent stops for replacement or repair, the cost of the job may be prohibitive.

The purpose of this bulletin is to show how the toughest steel known is helping to reduce costs in the construction industry—*American Manganese Steel Division of the American Brake Shoe Co., Chicago Heights, Ill.*

Vacuum Filters—A bulletin on continuous vacuum filters and dryers will be of particular interest to chemical and other process industries with a dewatering or filtering problem. The booklet is of 48 pages and is thoroughly illustrated with photographs and blueprints.—*The Eimco Corp., 634–666 So. 4th West St., Salt Lake City, Utah.*

Interchangeable Ball Bearings—The 1944 edition of "Interchangeable Ball Bearings for Replacement," contains numerically arranged lists of various makes of ball bearings.

In addition there are these four sections: A table of New Departure bearing dimensional tolerances according to various ABEC specifications; a section explaining the meaning of prefixes and suffixes used with each make of bearing; comparative bearing type and series numbering systems; and interpretation of New Departure bearing numbers for applying numerical designations to various bearing characteristics.

This same company has put out a new booklet on "Service Procedure for Ball Bearings." *Advertising Department, New Departure Division of General Motors, Bristol, Conn.*

Steel Cutting With Carbides—a Vest-pocket "handy guide" for steel cutting with carbides has been issued. The booklet covers the characteristics of different grades of carbides designed for steel cutting, selection of proper rake and relief angles, size of radius, etc. Major considerations as to machine requirements, speeds and feeds are given, together with grades recommended for different classes of steel. Design and grinding of chip breakers is dealt with in detail, as is the problem of supplying coolant in proper amounts and properly directed. The 16-page pocket guide concludes with operating hints and "Do's and Dont's" on carbide tools. Of particular interest are the trouble-shooting suggestions to be followed in case of tool chatter.—*Carboloy Co., Inc., Detroit 32, Mich.*

Fire Retarding—The story of zinc borate is told in a new booklet which

Where PRECISION is All-important...

Too much depends on the reading-clarity of a blueprint to let a better tracing-quality pencil pass without investigation! HI-DENSITY line from a modern *Hi-Density Microtomic Van Dyke* pencil will hold crisp, sharp clarity in your finest details. Even on a high speed blueprint machine, or other quantity reproduction processes. 18 degrees from 9H to 7B, and 6 degrees (4B–2B–HB–2H–4H–6H) with rectangular "chisel point" leads.

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MICROTOMIC VAN DYKE

DRAWING PENCILS

IF YOU WISH THIS 20" SLIDE RULE created by Eberhard Faber as a war-time service to engineers and draftsmen sign below and mail with 25¢

EBERHARD FABER PENCIL CO.,
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For enclosed 25¢ please send VAN DYKE 20" SLIDE RULE—war-time card printed edition.

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End Tilt Adjustment quickly and easily made
...another of the many high-efficiency features on the new HEIL
Cable Dozers
for International Harvester TracTracTors

The side-arm ears can be placed between the mouldboard ears at several different points for adjusting tilt at various angles.

To establish a sloping cut . . . to peel a bank . . . to maintain a level cut when the tracks must travel on a slope . . . it's a simple matter to adjust the end tilt on the Heil Cable Dozer. Here's one more of the many features that assure high efficiency . . . through careful engineering which has accomplished perfect teamwork between tractor and dozer all along the line.

You can depend on Heil Cable Dozers to give you *positive* action . . . *smooth* performance . . . *full* visibility . . . and require *minimum* maintenance.

To get jobs done faster . . . and at a profit, investigate the possibilities of Heil Cable Dozers now.

Send for bulletin.

R-21

SEE YOUR INTERNATIONAL TRACTRACTOR DEALER

THE HEIL CO.

GENERAL OFFICES • MILWAUKEE 1, WISCONSIN

is of special interest because a demand for fire-retardant materials, which also provide resistance to mildewing, weathering, water and other solubilizing agents, has been brought about by the widespread use of war supplies under all types of weather conditions in all parts of the world.

Zinc Borate-3167 has been used in the war effort in large quantities, especially in fire-retardant compositions for treating textile fabrics such as camouflage nettings, osnaburg cloth, cotton duck, and cotton drill. This product is also incorporated in electric cable sheathing to help prevent the spread of fires on shipboard. It appears that the action of Zinc Borate 3167 is catalytic rather than mechanical. There is considerable experimental evidence to indicate that at temperatures approaching the ignition point, Zinc Borate 3167 catalyzes the decomposition of the chlorinated materials, which gives the fire-retardant effect. Carbonization of cellulose below flame temperatures is accelerated. *The New Jersey Zinc Company, Development Products Division, 160 Front St., New York 7, N. Y.*

Arc Welding for Cast Iron—A 12-page illustrated booklet, "4 Ways to Salvage, Reclaim and Conserve Iron Castings by Electric Arc Welding" opens with a discussion on the difficulties which are encountered in arc welding cast iron, and points out that there is no single welding material or procedure which can be recommended as a universal practice. It is emphasized that the selection of a procedure for a specific application should be based on the requirements of the finished job. Four types of electrodes for use on cast iron are described, and the characteristics and best welding procedures for each are explained. Microphotographs of deposits made by the various electrodes are used to show the penetration, the grain structure at the fusion zone, and the grain structure of the deposit.—*C. E. Phillips & Co., 2750 Poplar St., Detroit, Mich.*

Continuous Band Filing—A continuous band filing machine is described and pictured in a 4-page file-size bulletin, which shows how continuous band filing supersedes hand filing and reciprocal machine filing operations through tests indicating the continuous file broaching operations are faster than former methods. Illustrations of the machine in operation show various internal and external file broaching jobs and the ease with which inexperienced operators can perform this work.—*Continental Machine, Incorporated, 1301 Washington Avenue, South, Minneapolis 4, Minn.*

MEN AND JOBS

rank L. Barlow, Stonington, Conn., been named assistant deputy comp-er of Connecticut in charge of pub-works. The General Assembly estab-ed this new position replacing the ished Public Works Department. Barlow is a general contractor.

awrence S. Bellman, John Gillett John N. Richards have announced change in the name of the firm of s, Rhines, Bellman & Nordhoff to man, Gillett & Richards. This office, ed by George S. Mills in 1892, the addition of George V. Rhines 893 and Lawrence S. Bellman in 5, has carried on the practice of itecture and engineering in Toledo, , continuously since its founding.

loward F. Carpenter has been ap-ted superintendent of the Provi-ce, R. I., sewage disposal plant, eeding Julius W. Bugbee, retired. Carpenter has been assistant super-ndent for the past seven years and been on the engineering staff of the for sixteen years. He has been e in the reconstruction and altera-of the disposal works.

ransfer of **Maj. Adellon Hogan,** E., Fort Lewis, Wash., area engi-, to Fort Leonard Wood, Mo., was ounced recently by Col. Conrad P. dy, Seattle district engineer. **Capt. B. Matlock** of the Seattle office, S. Engineers, was named Major an's successor at Fort Lewis.

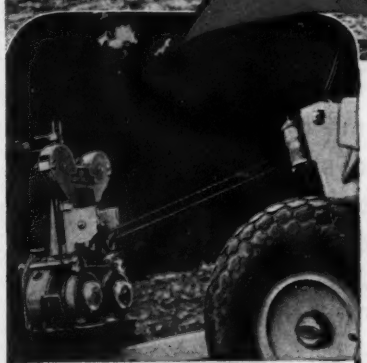
. S. Faircloth, superintendent of municipal water and sewer depart-t at Carolina Beach, N. C., has re-ed to become superintendent of the olidated public works, fire and e departments at Wrightsville ch, N. C.

ames C. Ryan has been appointed engineer at Youngstown, Ohio. A struction engineer, he assisted yor Ralph W. O'Neill, when the r was city engineer. Ryan served ngineering posts in various Ohio s before going to Youngstown.

rnest P. Goodrich on Dec. 31 inated his personal service con-t with the Navy Department and resumed his general consulting ineering practice at 175 Fifth , New York City.

lbert E. Leedy, for 18 years assis-engineer of the water department

You move more dirt per hour at less expense... with HEIL CABLE SCRAPERS



1 **LOAD FASTER** because of the rapid raising and lowering of the cutting bit, made possible by the fulcrum-type lift.

2 **MORE YARDS OF DIRT** with a given output of tractor horsepower, because the bowl fits the load without extra digging time.

3 **ECONOMICAL HANDLING** because the speed, flexibility, and scientific weight distribution assure bigger yardage at lower cost.

4 **LESS CABLE REPLACEMENT** because rope lasts up to four times as long. Many report savings of ¼¢ to ½¢ a yard.

5 **FASTER UNLOADING**—all the load can be spread smoothly and evenly at high speed — with no sticking in the bowl, even in wet, sticky soils.

CABLE POWER Costs Less

Simple, fast-operating Heil Power Control Units lower operating costs

Smooth-operating brake and clutch assemblies eliminate shocks and jerks; the large drums run cool; the sheaves are designed to reduce wear on cables. This adds up to minimum outlay for cable replacement. Fingertip control gives lightning-fast response for bigger yardage.

...and that isn't all:

Heil engineering gives you all-welded construction; scientifically located draft-pivot point; ample tire clearance; and an all around design that assures you of easier maintenance and simpler field repairs.

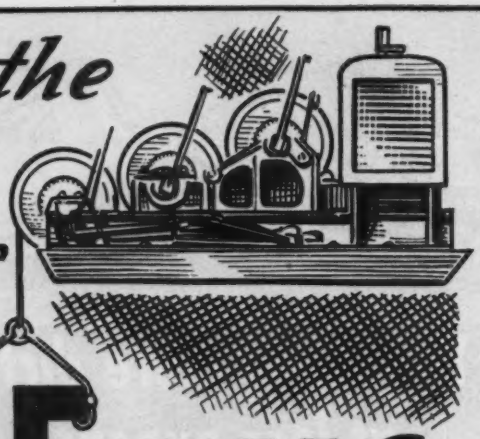
Write for descriptive bulletins. R-22

ARMY E NAVY

THE HEIL CO.

GENERAL OFFICES • MILWAUKEE 1, WISCONSIN

Takes the "IF" out of LIFTING



There are a lot of mighty big IFs in every Lifting Job. IFs that can cost you time and money. "If this," "If that" . . . . they can all mean trouble IF you don't have the right equipment!

A Novo Hoist will eliminate most of these IFs. Novo Hoists are rugged, sturdy, and built to stand the gaff. They have ample power, and are job-designed and field-proven. Novo's complete Line of Hoists ranges from 1,000 to 8,000 lb. capacity. To take the IF out of your Lifting Job, get a Novo Hoist!

You don't need a "pull" to get the latest information on Novo Hoists. Just fill in the attached coupon.

Also a member of A.E.D.

NOVO ENGINE COMPANY LANSING, MICHIGAN

COUPON Send me complete information on the following types of Novo Hoists: Contractor___ Drag Line___ Mining___ Fertilizer___

NAME_____

ADDRESS_____

at Youngstown, Ohio, has been appointed chief engineer of the plant, filling the vacancy created by the death of Arthur L. Schmidt, chief engineer for many years.

Denis Stairs, director and chief engineer of Montreal Engineering Co., Ltd., and for the past three years director-general of the defense projects construction branch of the Canadian Department of Munitions and Supply, has been appointed deputy power controller in the same department. Mr. Stairs is a civil engineer with over 30 years' experience in North and South America.

Lt. Col. William A. Davis, Jr., has become district engineer of the Little Rock District, U. S. Engineers. Colonel Davis has been district engineer for the Nashville, Tenn., district. Previously he was district engineer in Kingsport, Tenn. Col. Davis replaces Col. A. M. Neilson, now on the staff of Gen. Douglas MacArthur.

Davis, a native of Pennsylvania, was graduated from West Point in 1931. He received his Bachelor of Science and Master of Science degrees in civil engineering from the Carnegie Institute, Pittsburgh, Pa.

G. E. Robinson, assistant engineer of structures for the New York Central railroad, Line West, with headquarters at Cleveland, has been appointed assistant engineer of bridges in Chicago. **A. M. Westenhoff,** formerly assistant engineer of bridges in Chicago, will succeed Robinson at Cleveland.

Major J. P. Carriere has recently returned overseas to the 3rd Battalion R.C.E. Before joining the Army, Major Carriere was senior assistant engineer at the Montreal office of the Department of Public Works of Canada.

Fred G. Healy has been appointed acting state highway engineer of New Mexico, succeeding F. M. Limbaugh.

Diamond Core Drilling Contractors

FOUNDATION TESTING
Dams, Heavy Structures, etc.
STAGE SECTIONAL
PRESSURE GROUTING
Contract or Rental

MFR'S DIAMOND & SHOT CORE DRILLS GROUT MIXING MACHINES PACKERS AND GROUT PUMPS

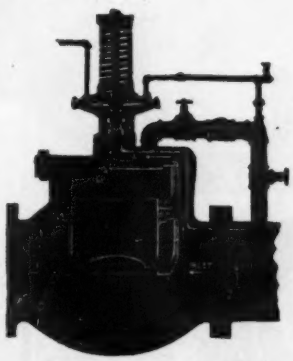
MOTT CORE DRILLING CO.
HUNTINGTON, W. VA.

FORECAST EFFICIENT, TROUBLE-FREE VALVE SERVICE FOR FUTURE JOBS BY SPECIFYING G-A Valves

Most prominent among GOLDEN-ANDERSON alves' many advantages are efficient operation and ng trouble-free service. Because each part of every OLDEN-ANDERSON Valve is tested for strain far yond rated operating capacity you may be confi- nt that each G-A unit is a long-lived, highly efficient it that's bound to do its job.

ake GOLDEN-ANDERSON your choice regardless of e type of water service. This line *is complete* . . . d offers a size and type valve to meet any opera- nal requirements.

test catalogs will be sent on request. Write for urs today!

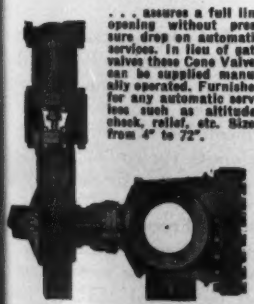


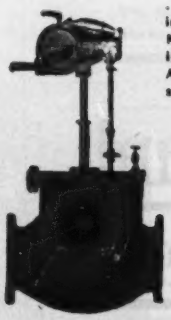
ALTITUDE CONTROL VALVE

Maintains constant water level within 3 to 12 in. variation. Differential control permits delayed opening for any depth tank. May be arranged for remote control. Supplied in 2 to 36 in. sizes, single or double-acting.

CONE THRU-FLOW VALVE

. . . assures a full line opening without pressure drop on automatic services. In lieu of gate valves these Cone Valves can be supplied manually operated. Furnished for any automatic services such as altitude, check, relief, etc. Sizes from 4" to 72".



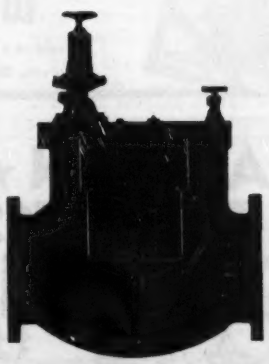


CONTROLLED FLOAT VALVE

. . . adaptable for water level control in heaters, reservoirs, basins etc. Needle valve control permits regulating closing speed to suit conditions. Air and water cushioning assures smooth operation. Sizes from 3" to 36".

WATER REDUCING VALVE

Gives constant terminal-delivery pressure under varying demands. No shock or jar upon adjustment. No metal contacts. Sizes ½ to 36 inches.



GOLDEN-ANDERSON
VALVE SPECIALTY COMPANY

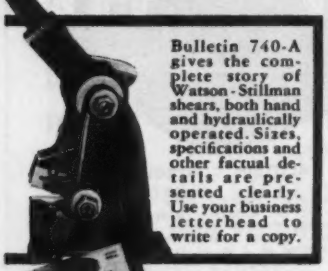
1300 FULTON BLDG. **PITTSBURGH, PA.**

Wire Rope Shears

SPEED WAR PLANT CONSTRUCTION

In the Building of Huge Concrete War Plants, Like the One Shown Here, W-S Wire Rope Shears Are an Indispensable Part of the Contractors' Equipment.

The Watson-Stillman wire rope shear, which is equally efficient for cutting round bars, proved an ideal tool in the war-plant construction program. This sturdy, hand-operated shear combines speed and precision, can be quickly moved from one section of the job to another, and can be handled easily by workmen. Blades of hardened tool steel are available for cutting round bars up to ⅞ in. diameter; flat bars up to 2½ x ½ in.; and wire rope up to 1⅛ in. diameter, of various kinds of metals. This shear is 16½ in. long, 7 in. wide, and 24½ in. high. Changing the knives requires only a wrench. W-S Hand Pumps and Jacks are also indispensable equipment on any construction job where speed and utility are required. The Watson-Stillman Co., Roselle, N. J.



Bulletin 740-A gives the complete story of Watson-Stillman shears, both hand and hydraulically operated. Sizes, specifications and other factual details are presented clearly. Use your business letterhead to write for a copy.

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Designers and Manufacturers of Forged Steel Fittings and Valves, Shears, Pumps, Jacks, and Hydraulic Equipment.

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Hayward Buckets

Use this Class "E" Clam Shell Bucket for handling crushed stone, gravel, sand and other bulk materials.

THE HAYWARD CO., 48-50 Church St., N. Y.

On March 16, Charles Miller Hick, city engineer of Mount Vernon, N. Y., expects to celebrate the 50th anniversary of his service for that New York suburban municipality.

Mr. Hick's first job was with the board of water supply at Syracuse, N. Y. After two years there he became transitman and draftsman with the newly formed engineering bureau in Mount Vernon. He later became assistant engineer, and in 1906 city engineer. Mr. Hick has taken an active part in his community's rapid development in recent years.

I. C. Steele, chief of the division of civil engineering of the Pacific Gas and Electric Co. since 1921, has become chief engineer, and **Walter Dyer,** assistant chief of the division since 1929, has been promoted to the position vacated by Steele.

Collingwood Bruse Brown, consulting engineer of the Canadian National Railways, is retiring after 30 years service with that line and its predecessor, Canadian Government Railway.

Harry B. Burton, highway commissioner of Waukesha County, Wis. for the past ten years, has resigned.

John F. (Jack) Partridge has left the position of construction engineer for the Tennessee Valley Authority at Fort Loudoun Dam to become a major in the Allied Military Government to supervise newly won territories. Partridge went to TVA in 1934 from the West Coast and has since served in the personnel department and on construction at Hiwassee and Fort Loudoun dams.

L. W. J. Cooper, service director at Canton, Ohio, resigned Jan. 1. He intends to establish a private engineering and surveying business. Before his appointment as service director he had been with the city engineering department at Canton for several years.

Simon W. Freese, Ft. Worth, Tex., consulting engineer of the firm of Freese & Nichols, has been commissioned a major in the Allied Military Government service and has reported to the University of Virginia at Charlottesville. Lately he has been engaged almost constantly in construction of military camps and installations throughout the South.

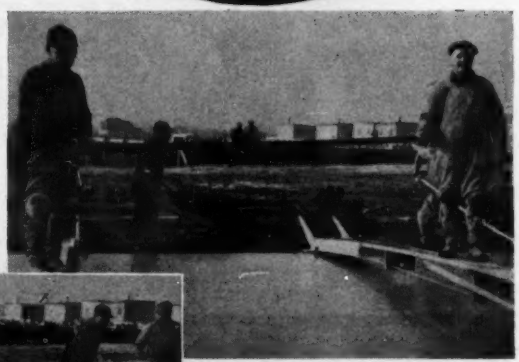
Eugene E. Halmos, associate of Pur-

Keystone ASPHALT MASTIC BOARD DUMMY JOINTS

Quick and easy to handle—it's ⅛" thick and furnished in full size sheets scored to the required width—one simply breaks off the strips as needed.

True and straight alignment obtained without expensive installing machinery.

This new, practical, ready-to-ship paving joint material, tested and proved by leading engineers "on-the-job" under all kinds of conditions, can be used transversally or longitudinally. Its low cost, ease of handling, absolute waterproofness and maximum rigidity make it the material to use where "weakened plane" type construction joints are required.



THREE EASY STEPS...

These photographs show the three easy steps to installing Keystone Dummy Joint—no expensive equipment is needed—yet alignment is straight and true.

1. Using a bridge over the wet concrete, the strip is carried out for this longitudinal installation. (Transverse contraction joints are installed the same way.)

2. Then the strip is placed in a simple steel installing channel. The men, kneeling on the bridge, press both joint and channel into the wet concrete — there's no difficulty keeping accurate alignment.

3. The joint, completely imbedded in the concrete, the steel channel is withdrawn, leaving the Dummy Strip intact. As fast as concrete is poured, the progress is repeated.

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Catalog with detailed description of all Keystone Products sent on request. Write Department K.

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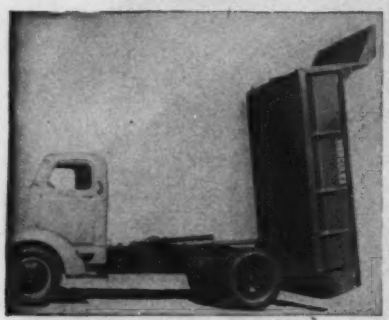
MANUFACTURING PLANT • CHICAGO HEIGHTS, ILL.

PREMOULDED ASPHALT AND FIBRE EXPANSION JOINTS AND ACCESSORIES
JOINT SEALING COMPOUNDS AND CRACK FILLERS

BODIES and HOISTS LIKE THESE *by* HERCULES...



Hercules High Dumper
Power up, Power down

are giving maximum service with minimum expense, day after day, on the home front.

"Victory is our business", and our war production is playing an important part in bringing victory nearer; but production for essential civilian use is also important, and we're able to make quick deliveries on many types of Hercules Hydraulic Hoists and Bodies to you.

See your Hercules Distributor, or send inquiries direct to us.

HERCULES
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Hercules Low-mount Sanitary Body

Hercules Braced Side Rub Rail Body

Hercules 6-Batch Coal Body

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Washington, D.C.

sons, Brinckerhoff, Hogan and MacDonald, consulting engineers, New York, has completed a three year period as engineer of design review with Dryderk Engineers, New York, on special work for the Navy. Mr. Halmos has been with the Parsons firm since 1912.

H. T. Ammerman, formerly division engineer in the Tennessee Department of Highways and Public Works, has succeeded the late Briggs Smith as maintenance engineer.

Capt. Garland J. Robinson, Jr., of Houston, Tex., has been awarded the Legion of Merit for his work as engineering officer with the Fifth Air Force's light bombardment group in New Guinea. Captain Robinson received his engineering education at Rice Institute and the University of Houston.

George H. Hutchinson, 83, assistant chief engineer, Pittsburgh Ohio Valley Railway Co., was honored at a farewell dinner in Pittsburgh recently for 63 years as an engineer.

J. Harper Wetherington has been certified by the North Carolina State Department of Sanitary Engineering and the State Health Department as sanitary engineer for the city-county health department at New Bern, N.C.

Frank R. Creedon has become construction manager of Stone & Webster Engineering Corp. He had been asst. deputy rubber director in charge of the plant construction program of the Rubber Administration and later was with Col. Bradley Dewey as asst. rubber director. Previous to that, he was for three years chief of the Munitions Plant Section, Office of Chief of Engineers, U.S. Army, charged with executive direction of the construction program of the Engineer Corps of the War Department for the production of explosives and armament and facilities for troop training. He is a graduate of Massachusetts Institute of Technology.

H. H. Roberts, formerly associated with Guy F. Atkinson Co. at Grand Coulee Dam, Mud Mountain Dam, Neah Bay Breakwater and Navy construction on the West Coast has left that organization to assume duties of chief engineer in the Construction Division for Contractors, Pacific Naval Air Bases, which is at present engaged in the construction

As soon as she puts on her light dress again!...

PEACE on the war fronts will not mean peace for contractors . . . it will be your call to start the battle of reconstruction . . . your job to tackle those new housing developments, super-airports, public works, highways, factories.

Your problems will not be easy or new—certainly they will be different. Not the least of these will be your insurance and accident prevention problems, but here's a recognized way to get the specialized help you need. American Mutual's long, practical experience helping contractors should be very useful to *you*. Make use of it now to complete jobs on time and to specification.

Dividends to policyholders have never been less than 10%.

Get American Mutual's "extras," designed to help contractors; construction-wise safety engineering experience, construction-wise claim and medical service, lower insurance costs,* trained insurance experts, the confidence established by American Mutual's name on any contract. We've written a booklet that describes them all for you. Send for your copy of the free "Five Extras" booklet today.

And take another look at your copy of the American Mutual's other notable booklet, "Foremanship and Accident Prevention in Construction." It's the basis of successful safety programs of thousands of construction foremen. If you haven't a copy, ask for one—free. American Mutual Liability Insurance Company, Dept. O28, 142 Berkeley Street, Boston 16, Mass.

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Your helping hand in building tomorrow's "new worlds"

AMERICAN MUTUAL

... the first American liability insurance company

WYTEFACE "A"

TRADE MARK

STEEL TAPES

K&E
REG. U. S. PAT. OFF.

Easy-to-read, *raised* black graduations on crack-proof white surface ... resist abrasion from rock, sand, scraping over rails, pipe, concrete, etc. In all sizes and types—in cases or reels. Ask your dealer—or write for catalog.

EST. 1867
KEUFFEL & ESSER CO.
NEW YORK · HOBOKEN, N. J.
CHICAGO · ST. LOUIS · SAN FRANCISCO · LOS ANGELES · DETROIT · MONTREAL

SEA WALL IN NEW YORK

This concrete sea wall had been ocean-pounded almost to destruction, when reinforced "GUNITE" was enlisted to save it. Now, for six years, Neptune has "huffed and puffed" in vain! Investigate "GUNITE!"

The "CEMENT GUN" can be bought by anyone, and used without restrictions.

CEMENT GUN COMPANY
Manufacturers of the "CEMENT GUN"
ALLENTOWN, PENNSYLVANIA

WE ARE ALSO "GUNITE" CONTRACTORS
LET US BID ON YOUR WORK

Rendering a much needed service

GALVANIZING

PROTECTS VITAL STEEL

To Economize—galvanize at

ENTERPRISE

GALVANIZING CO.

2519 E. Cumberland St., Phila. 25, Pa.

of advance naval base depot facilities on the West Coast.

Col. Robert Clayton Williams, former instructor for the 105th Engineers, North Carolina State Guard at Charlotte, N. C., now is commanding officer of the 1323rd Engineers in Texas, having recently been transferred from Jefferson Barracks, Mo.

Roy E. Ward, district manager of The Austin Co. at Los Angeles, Calif., since 1925, has been made a vice president. Mr. Ward was graduated from the University of Michigan in civil engineering. After seven years spent in structural design, plant lay-out work and the design of dams and power plants, he joined Austin in 1917. Following two years in Philadelphia and Washington, he was named manager of Austin's materials sales division. He was named Cleveland district manager in 1924, and the following year was placed in charge of all the company's activities in southern California.

Frank W. Maynard, district manager at Oakland, Calif., since 1925, has also been made a vice president. He is a civil engineering graduate of Worcester Polytechnic Institute and joined The Austin Co. in 1917. He spent a year in the Army Engineers Corps, and returned to Austin in 1919. After five years in the estimating and sales departments, he was named district engineer at San Francisco in 1924. Except for the past two years, when he was specially assigned as project manager in charge of design and construction of two large Defense Plant Corp. plants for Dow Magnesium Corp. in Michigan, he has served successively as sales manager, resident manager and district manager at Oakland.

August H. Wagener, formerly director of planning for the city of Rochester, N. Y., has been appointed Commissioner of Public Works of that city.

E. Arthur Bell, borough engineer of Essex Fells, N. J., has enlisted in the U. S. Naval Reserve with the commission of Lieutenant (j.g.) and is temporarily stationed at Camp Peary, Va.

WHERE STEEL IS KING!...

here's an especially appropriate point to this picture of a Mack in a big el mill. In the world of durable materials, steel is king. Steel for strength. eel for durability. And in the world of trucks, Mack reigns on these same o counts. It is Mack for strength. It is Mack for durability. *For the very ckbone of Mack construction is Mack's lavish use of heat-treated alloy steels.* uilt like a Mack Truck" means built to work hard . . . to stay on the longer . . . and to do the job at lowest cost.

Mack Trucks, Inc., Empire State Building, New York, N. Y. Factories at Allentown, Pa.; Plainfield, N. J.; New Brunswick, N. J. Factory branches and dealers in all principal cities for service and parts.

Mack

TRUCKS
FOR EVERY PURPOSE
ONE TON TO FORTY-FIVE TONS

BUY U. S. WAR BONDS

IF YOU'VE GOT A MACK, YOU'RE LUCKY . . . IF YOU PLAN TO GET ONE, YOU'RE WISE!

WELLMAN Williams Type BUCKETS

Welded Rolled Steel

FOR GREATER STRENGTH AND LONGER SERVICE

Wellman Buckets combine all the mechanical advantages of the famous Williams Bucket with the welded construction features formerly found in Wellman custom-built heavy duty steel mill buckets.

Send for Free Bulletin

Tell us about your particular requirement and we will send full description of construction and features in special bulletins which clearly prove why YOUR NEXT BUCKET SHOULD BE A WELLMAN-WILLIAMS.

ARMY E NAVY

THE WELLMAN ENGINEERING COMPANY

7000 Central Avenue — Cleveland 4, Ohio

SALES AND SERVICE AGENCIES IN PRINCIPAL CITIES

WHAT MAKES A MAILING CLICK?

Advertising men agree . . . the list is more than half the story. McGraw-Hill Mailing Lists, used by leading manufacturers and industrial service organizations, direct your advertising and sales promotional efforts to key purchasing power.

In view of present day difficulties in maintaining your own mailing lists, this efficient personalized service is particularly important in securing the comprehensive market coverage you need and want. Investigate today.

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DIRECT MAIL DIVISION

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MANUFACTURERS' ACTIVITIES

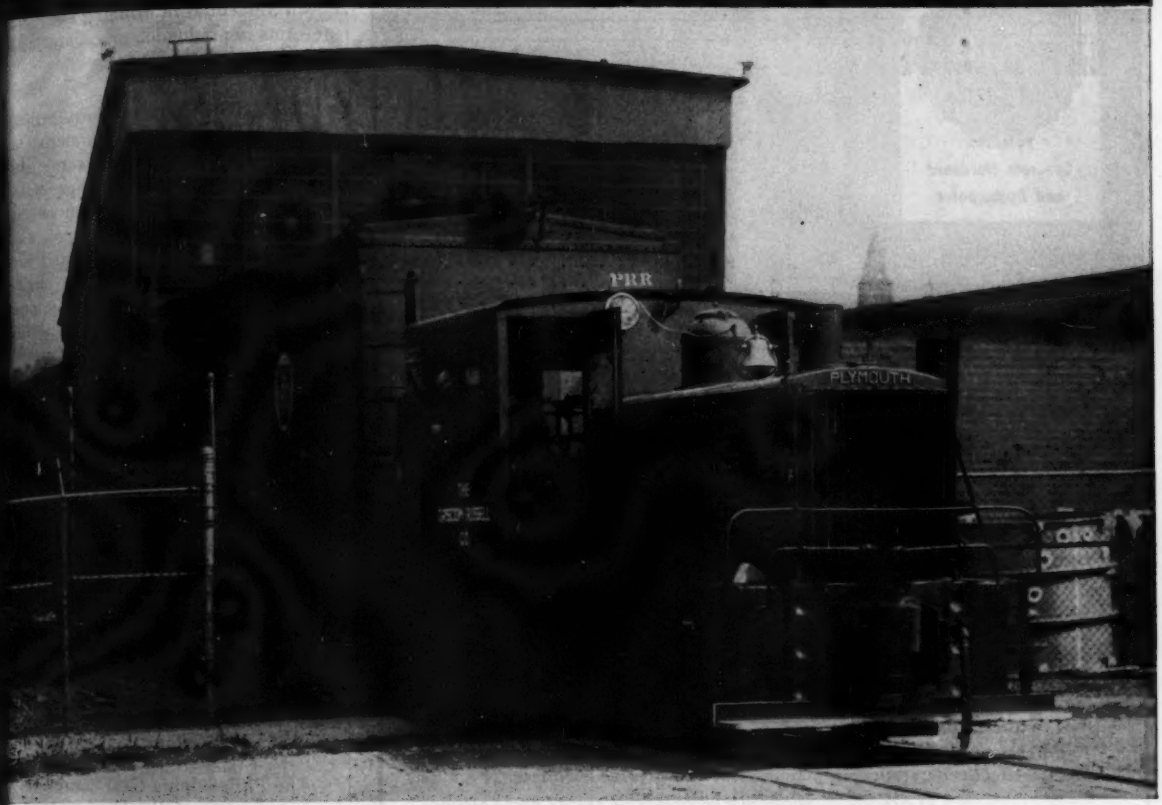
P. V. Moulder, former assistant to the second vice president of the International Harvester Co., has been appointed general manager of the new International truck division. Moulder's jurisdiction will include the motor truck factories at Fort Wayne and Indianapolis, Ind., and Springfield, O.; the motor truck engineering department at Fort Wayne; and all exclusive motor truck sales operations, both wholesale and retail, in the United States, as well as exclusive motor truck dealers. The company's combination motor truck and farm equipment sales branches and combination dealers will be managed cooperatively by the International truck division and other interested departments. Moulder's divisional staff will be composed of five managers, respectively directing engineering, manufacturing, supply and inventory, sales, and accounting.

John E. Angle has been appointed assistant general superintendent of the Gary Sheet and Tin Mill of Carnegie-Illinois Steel Corp., U. S. Steel Corporation subsidiary, succeeding C. A. Ferguson, recently promoted to the office of chief engineer. Following his graduation from Lehigh University in 1932, Mr. Angle began his service with U. S. Steel as a junior metallurgist in Gary, Ind. In 1935 he became chief metallurgist. Ralph P. Deputy is the new division superintendent of the Gary Sheet and Tin Mill, succeeding Mr. Angle.

The Huber Manufacturing Co., manufacturer of road building machinery, Marion, Ohio, has appointed D. A. Howard president and general manager to fill the vacancy left by the late E. J. Schroeter.

Mr. Howard joined the company in May, 1924, as treasurer. In May, 1929, he was elected secretary-treasurer and appointed a director. In December, 1942, he became vice president and treasurer

"Severe Service Required"



"Greater Handling Ease and Less Maintenance with Plymouth"

Neil B. Miller, Supt. of The Griscom-Russell Company of Massillon, Ohio gives this very favorable report on their Plymouth Locomotive after 2½ years of continuous service:

"Our 35 ton Plymouth Gasoline Locomotive has been in continuous operation, eight hours per day, since August, 1941. To date it has only required minor repairs. The service this locomotive has to perform is quite severe, being required to haul from one to four cars over company track having a curvature of 75° maximum and grade up to 6%. With gasoline mechanical power, we have found greater ease of handling cars along with less maintenance of road-bed and unit proper. We, therefore, are well satisfied with our Plymouth."

From everywhere comes the same good story of Plymouth efficiency and economical performance. Plymouth power, speed and flexibility are setting real records for moving more tonnage — faster, and at lower cost. If you have an industrial transportation problem, a Plymouth Gasoline or Diesel Locomotive will bring the solution. Write for complete details today!

TRACK HAULAGE IS CHEAPER HAULAGE

PLYMOUTH GASOLINE and DIESEL LOCOMOTIVES

PLYMOUTH LOCOMOTIVE WORKS

Division of The Fate-Root-Heath Co. PLYMOUTH, OHIO, U. S. A.

TODAY—more than ever, you have to be sure that concrete floors will stand up under heavy-duty use.

Once production begins, hours lost, whether due to the necessity of repairs or to the labor expended in keeping concrete floors dust-free—means money lost.

A twenty-five year performance record shows that a Lapidolized concrete floor is capable of withstanding the hardest punishment to which industrial floors are exposed.

The new patented features found only in Lapidolith Liquid assure even greater effectiveness—deeper penetration, and greater hardness.

Tests conducted in outside engineering laboratories amply demonstrate that Lapidolized concrete is more than twice as hard as untreated concrete.

Lapidolith Liquid is easy to apply and its use on new or old floors will not interfere with the occupation or use of a floor.

Write Dept. R10 today for the free booklet, "Concrete & Lapidolith," with a Lapidolized sample which is suitable for a paperweight. It gives accurate, factual performance data. It shows why Lapidolith Liquid is the wisest choice for protecting old and new concrete floors.

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SECTIONS 9/18 • 14/17

BUILDING PRODUCTS DIVISION

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88 LEXINGTON AVENUE NEW YORK 16, N. Y.

DOBBIE FDRY. & MACHINE CO.
NIAGARA FALLS, N. Y.

FALL LINE BALLS

Capacities
3 to 50 Tons

Weights
50 to 800 Lbs.

WRITE FOR CATALOG
Derricks — Winches — Sheaves

NEED A BIG Trailer?

La Crosse Makes Them Up To 200 Ton Capacity-

** WRITE OR WIRE **

LA CROSSE TRAILER & EQUIPT. CO.
LA CROSSE, WISCONSIN U. S. A.

and in January, 1943, was made vice president and general manager.

Mr. Howard, born in 1892, attended Ohio State University. As vice president and general manager Mr. Howard has been influential in bringing about many reforms in production procedure and has taken an active interest in sales.

The Griffin Wellpoint Corp., manufacturers of systems for dewatering and water supply, high pressure jetting pumps, portable fire pumps and oil pumping equipment, and their associate, the Griffin Equipment & Supply Corp., manufacturers of gasoline and diesel engine-driven generator sets, lighting plants, portable floodlighting equipment, and gasoline and diesel engine-driven marine auxiliary sets, have arranged for the distribution of these products through warehouse stocks maintained at the Griffin Engineering Corp., 633 North Myrtle Ave., Jacksonville 4, Fla., and the Griffin Engineering Corp., 548 Indiana St., Hammond, Ind.

Fred T. Wiggins, formerly sales manager in Birmingham, Ala., for the Universal Atlas Cement Corp., a U. S. Steel subsidiary, has been appointed assistant to the vice president in charge of sales, in New York. Robert H. Bond has been appointed sales manager in Birmingham, succeeding Mr. Wiggins. The changes were effective Feb. 1.

The Philadelphia Gear Works has announced the following organization changes:

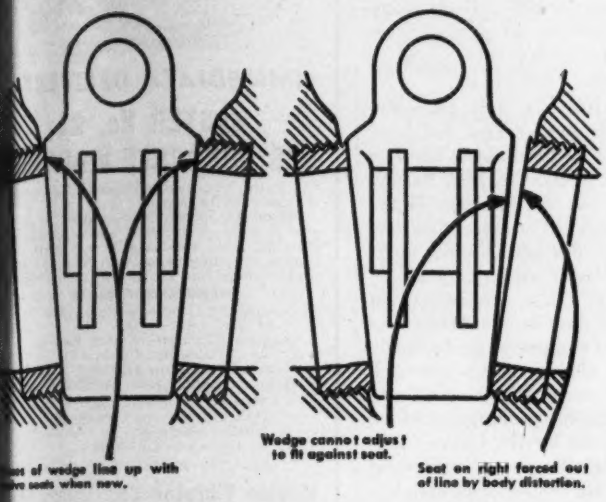
James N. Morrell has becomes sales manager, Limitorque Valve Control Division of Philadelphia Gear Works, Philadelphia, Pa.; Thomas V. Withington has relinquished his position as chief engineer to become assistant sales manager, Limitorque Division.

William F. Plume succeeded Mr. Withington as chief engineer. Robert E. Richards is appointed assistant chief engineer.

A. C. Lewis, associated with Simplex jacks for more than thirty years, has been appointed vice president in charge of sales of Templeton, Kenly & Co., Chicago. He will make his headquarters in Chicago, but will maintain contact with Canadian distributors.

On joining Templeton, Kenly & Co. in 1912, Mr. Lewis was sent to Toronto to open a Canadian manufacturing plant. Prior to World War I, he went to England and the continent to establish European distribu-

"Body Blows" THAT KNOCK OUT VALVES

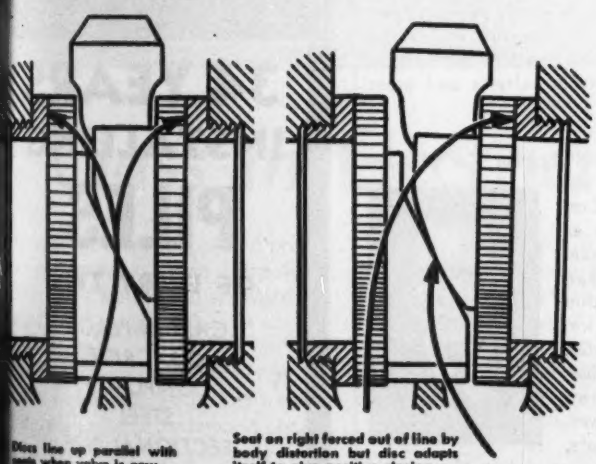


...s of wedge line up with ...ve seats when new.

...OVE—What happens before and after a taper seat gate valve is subject- ...d to body distortion is shown in these somewhat exaggerated diagrams.

BEFORE AND AFTER

...LOW—How the Darling Fully Revolving Double Disc Parallel Seat ...te valve continues to give positive closing despite body distortion.


Discs line up parallel with seats when valve is new.
Seat on right forced out of line by body distortion but disc adapts itself to give positive closing.
Curved face of wedge allows discs to adjust tightly against both seats.

ANY valve is tight on the drawing board, or on the assembly floor, but frequently a valve is installed with a pipe out of line, so that the valve body is subjected to unexpected "line strains."

Or expansion bends are not properly installed, so that the valve has to take the punishment of expanding and contracting lines.

The distortion of valve bodies is a continuous and almost microscopic process, but is one of the chief causes of leaking valves. Under the body blows of high temperature and pressure the valve bodies will change shape and valve seats will move out of their original line-up, preventing tight closing.

Over forty years ago Darling Valve & Manufacturing Company designed a valve that could take these body blows and still give positive closure. In the Darling Fully Revolving Double Disc Parallel Seat valve, there are two important features:

1. The floating discs are free to adapt themselves to change in the shape of the valve body, and to changed position of the valve seats.
2. The discs are fully revolving, seating in a different position each time, thus wearing evenly and always presenting a uniform surface against the valve seat. Even when worn thin the discs still furnish a positive seal.

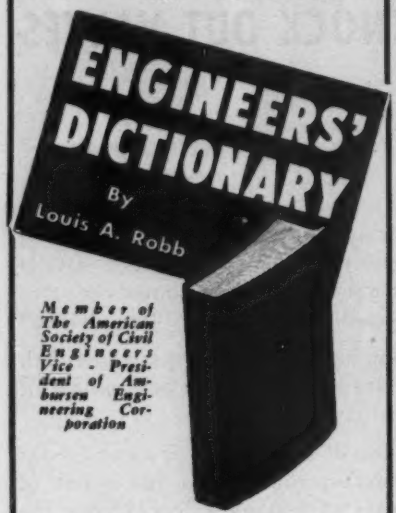
Darling is the only valve which has this simple and efficient design. For "positive closing, year after year," thousands of experienced valve buyers specify Darling for all their tough jobs.

TRADE DARLING MARK

VALVE & MANUFACTURING CO.

WILLIAMSPORT, PA.

If You're An
ENGINEER
Working With Spanish-Speaking People
You Need This Book!



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ENGLISH-SPANISH
DICTIONARY
of Current Central and South American Terms for

ARCHITECTS
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NOW! Understand—be undersood by—the Spanish-speaking people you meet in connection with engineering work. Over 44,000 mechanical and electrical terms such as you need for making out contracts, specifications and reports, and for necessary on-the-job orders and instructions. No need to be an expert in local dialects, either. You'll find the various local equivalents of important terms, as well as expressions from geology, chemistry and allied sciences. Save time, and insure perfect understanding with this ENGINEERS' DICTIONARY.

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tion. When Canadian manufacturing temporarily ceased in 1915 and the plant equipment was sold, Lewis resigned to form A. C. Lewis Company, Ltd., Canadian distributors for Simplex jacks. Manufacturing was continued by William Kennedy & Sons, Ltd., at Owen Sound, Ont.

Later, Lewis became a British subject and went to France as an officer of the Third Canadian Infantry Battalion, Toronto Regiment, in 1917. He was wounded at Amiens in 1918 and evacuated to Canada in 1919. Upon being discharged from the hospital, he returned to his business.

J. S. F. Carter has been appointed engineer in charge of design and engineering service for the Process Division of S. D. Hicks & Son Co., Inc., Boston, Mass. The expansion program of the company, established in 1841, is marked by the opening of a branch office at 51 East 42d St., New York City.

Two modern plants are located at Hyde Park and East Boston, Mass. The former handles equipment for complete chemical and alcohol plants and synthetic rubber plants for domestic and foreign installation, the design of which will be supervised by Mr. Carter. This shop fabricates all types of equipment in sheet and plate copper, steel, stainless steel, monel, nickel and aluminum.

The Wentz Equipment Co. of Topeka, Kans., will handle products of the Davey Compressor Co. of Kent, Ohio, including portable and industrial compressors, truck power take-offs and pneumatic saws. J. L. Wentz is president and active head of the company, maker and distributor of road scrapers, snow plows, half and full-circle culverts and other equipment.

The Cleveland Tractor Co. has announced the appointment of Leslie H. Hughes as advertising manager. He has had a similar position with the Brown Fence & Wire Co. of Cleveland, Ohio.

Mr. Hughes attended the University of Minnesota, where he was editor of THE MINNESOTA DAILY. He has been associated with Montgomery Ward, James Manufacturing Co., Sears Roebuck & Co., and the Brown Fence & Wire Co. in advertising capacities.

The Timken Roller Bearing Co. has announced the appointment of Paul Reeves as advertising manager to succeed Roland P. Kelley, who has resigned

IMMEDIATE DELIVERY
MASTER No. 23
GAS CONCRETE VIBRATOR
On Rush Jobs Today Dependability means maximum yardage placed daily.
Master Equipment is competitive in price and is built of the very highest quality of material and workmanship and gives the utmost in performance with long life and uninterrupted service in the use of years.

MANUFACTURERS OF
- Gas-Electric Generator Plants, 500 Watts to 15 KW—AC or DC.
- Concrete Vibrators—Gas or Electric.
- Concrete Surfacing Attachments.
- Master Power Blow Hammers & Tools.
- Complete line of High Speed Tools.

Master Distributors throughout United States and Canada. All Foreign territories — Armco International Corporation.
Send for #528 Bulletin today
Master Vibrator Co., Dayton, Ohio

MacArthur
34 YEARS INSTALLING PILES
OF EVERY TYPE
CAST-IN-PLACE
CONCRETE
COMPOSITE
STEEL
SECTIONAL PIPE
TIMBER
SOIL AND ROCK EXPLORATION
MacARTHUR CONCRETE PILE CORP.
18 EAST 48th STREET, N. Y. C.
Boston • Cincinnati • New Orleans

Class in Electricity

rawn from widely separated peace-
me occupations, these purposeful
rners in a Bethlehem shipyard are
ing taught the essentials of marine
ctrical work.

None of them had ever before set
ot in a shipyard, or had any expe-
nce with electricity beyond chang-
g a light bulb or plugging in a
aster. But soon these same men and
omen will be installing complicated
ctrical wiring on troopships and
rgo carriers—and doing the work
th speed and skill comparable to
experienced electrician.

Not that full-fledged electricians
n be produced in a few short weeks.
t by well-planned training, learn-
s who are responsive and alert can quickly be trained to do some one branch of the work, and do it with speed and proficiency.

Training unskilled workers in marine electricity has been done successfully by following the same principle as in training workers for hundreds of other jobs: Take complicated operations or crafts that normally call for perfected skills, and break them up into their simple, readily-learned component parts.

Since 1939 Bethlehem employment rolls have increased from 100,000 workers to nearly 300,000, while 66,000 employees have left to join the armed forces. Four out of five of our present employees are virtually newcomers, many of them women.

With instructors and supervisory people selected from among older employees to teach and guide them, these new workers have been given intensive, streamlined courses in the things they need to know.

Their zeal, their eager responsiveness to training, their ready adaptability to new tasks and surroundings, have paved the way for the all-time records Bethlehem is establishing in steel-making and ship construction.

BETHLEHEM STEEL

★ WORLD'S LARGEST SHIPBUILDER ★ SECOND LARGEST STEEL PRODUCER ★

SMITH EQUIPMENT

THE A.P. SMITH MFG. CO. EAST ORANGE, N.J.

Symbol of Quality Since 1889

A NAME TO REMEMBER

When you want good Water Works Equipment

It is an easy name to remember and also one worthwhile. Our experience gained in over 50 years of service enables us today to stand ready to help you get the best water works equipment available. Our men are experts in their profession and their skilled craftsmanship is known the world over.

When You Need Any Of The Following:

VALVES—HYDRANTS—for heavy and high-pressure service.	Write for Booklet 42 MF
TAPPING AND INSERTING VALVES, machines and accessories.	Write for Booklet 42 VH
WATER METERS—disc, current, disc-compound, current-compound.	Write for Booklet 42 M
CORPORATION AND CURB COCKS, PIPE CUTTERS, REPAIR SLEEVES, REMOVABLE PLUGS, INDICATOR POSTS, ETC.	Write for Booklet 42 Misc.

OTHER SMITH PRODUCTS

Valves and Hydrants — Valve Inserting Machines — Tapping Sleeves — Tapping Valves — Hat Flanges and Water Meters

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THE A. P. SMITH MFG. CO., EAST ORANGE, N. J.

THE MOUNT VERNON BRIDGE CO.

Engineers Contractors

STRUCTURAL STEEL

RAILWAY AND HIGHWAY BRIDGES

BUILDINGS AND VIADUCTS

MOUNT VERNON, OHIO

It's easier to lift, lower, push or pull the Simplex Way!

Simplex LEVER SCREW HYDRAULIC **Jacks**

for every construction purpose

Awarded the Gold Medal for Safety

Ask for Catalog 44

Templeton, Kenly & Co., Chicago 44, Ill.

to go into advertising agency work. M... Reeves is a native of Dover, Ohio, a... tended Stauton Military Academy a... is a graduate of Carnegie Institute ... Technology, with a degree in mecha... cal engineering.

Pinkney W. Love has been appoint... manager of the Washington, D. C., of... of Lukens Steel Co. and subsidiaries, By-Products Steel Corp. and Lukenweld, Inc. Mr. Love succeeds Charles A. Carlson, who is resigning to establish his own business for the manufacture of the Carlson internal combustion engine.

Mr. Love has been a special represe... tative for Lukens in Washington. H... was born in Baltimore County, Md., March 11, 1892. He attended publ... schools there and completed his educa... tion at St. John's College, Annapolis. In April, 1917, he enlisted in the U. S. Army, having been commissioned a sec... ond lieutenant in August, 1918.

Believed to be a new departure i... cooperative effort between industry an... education, an intensive two weeks' course in "Management for industrial supervisors" was opened recently at the Illinois Institute of Technology in Chicago. Eighteen foremen and supervisors from five Milwaukee firms were chosen to take the course. They came from Allis-Chalmers Mfg. Co.; Nordberg Mfg. Co.; Ampco Metals, Inc.; Chain Belt Co., and Harnischfeger Corp. The "students" receive full salaries with all expenses paid while in training. All costs of the training program are borne by the U. S. Office of Education through its Engineering, Science and Management War Training program. The idea is credited to Harry Rogers, works manager of the Nordberg Mfg. Co.

Kenneth F. Park, formerly chief field engineer of R. G. LeTourneau, Inc., has joined the Caterpillar Tractor Co., Peoria, Ill., as manager of its sales development division. A native of Arizona, Mr. Park has been associated with the heavy machinery business as earthmover or equipment man since 1926.

Mr. Park's formal schooling included some mechanical engineering, but it took him five years of hard work at night to earn a civil engineering degree. He spent several years doing survey work on Canadian railways, the townsite of Anchorage, Alaska, and in Mt. McKinley National Park. During World War I, Park was connected with the Seattle, Wash., shipyards. In 1926 he returned

VICTORY

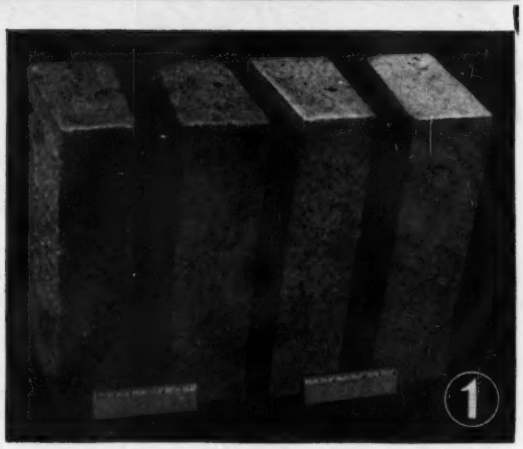
Para-Plastic

AN ELASTIC BOND SUSTAINING WATERPROOF ADHESIVE SEAL
HOT POURED, RUBBER-LIKE, EXTENSIBLE
AT LOW TEMPERATURES

A constantly increasing acceptance for good construction is proof of the value of Victory Para-Plastic in solving problems connected with Expansion Joints in concrete pavement.

The illustrations duplicate actual road conditions as closely as possible, using our Laboratory facilities to increase the tempo of, and accentuate seasonal expansion and contraction.

The test blocks were prepared with Servicised fiber Expansion Joint filler, the left set finished with a top seal of ordinary hot poured asphalt and the right set sealed with Para-Plastic.



Compression was introduced to duplicate expansion under summer heat. As is normal, the non-extruding fiber joint compressed within its own volume and the joints remained sealed. However, in illustration No. 2, the blocks have been returned beyond their original position as under contraction during winter periods.

In both sets, the fiber joint has expanded to a large percentage of its original thickness, leaving a gap between the block and filler on one side. But the asphalt seal has broken, permitting top to bottom infiltration; whereas the Para-Plastic seal retains its resiliency and the bond is unbroken—a permanent guard against water and other foreign substance.

Servicised Victory Para-Plastic Sealing Compound complies with Fed. Spec. SS-F-336 and C.A.A. Spec. P-605.

SERVICISED QUALITY PRODUCTS © 1930

SERVICISED PRODUCTS CORP.
6051 West 65th Street, Chicago 38, Ill.

SUPER-VULCAN OPEN TYPE

DIFFERENTIAL-ACTING

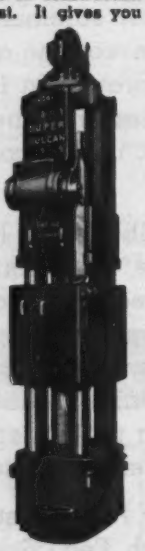
PILE HAMMERS

18C, 30C, 50C and 80C

• The Super-VULCAN demonstrates its cost-saving performance on construction jobs from coast to coast. It gives you twice the blows per minute—that's where a big saving in time and effort begins. Remember your Super-VULCAN uses 25% to 35% less steam per blow.

Be better prepared for those new construction pile driving jobs—do them at less cost — faster — easier. Super-VULCAN Hammers are being currently used in the Solomons and other theaters of war.

The super-VULCAN Open-Type fits same leaders — uses same accessories as VULCAN Single-Acting Pile Hammers and has same widely approved characteristics.



Sizes
18C—30C—50C—80C
meet all needs

•

VULCAN IRON WORKS Since 1832

331 North Bell Avenue

Chicago Illinois

to supervise the construction of extensive irrigation projects, leeves and protective embankments on the Pacific Coast. When Boulder Dam was started, he superintended the difficult job of constructing a road between the damsite and Boulder City. Mr. Park is author of one of the Army manuals, "Principles of Modern Excavation and Equipment," as well as numerous articles on construction and eathmoving. He also has done considerable lecture work recently for the U. S. Army, instructing officers in current methods of earthmoving and construction.

Standard Steel Corp., Los Angeles, Calif., manufacturers of paving plants, batching equipment, sub-graders, finishers and other construction equipment, has announced the appointment of Grant Davis as sales manager. Mr. Davis joins Standard Steel with a broad national experience, covering a period of 18 years in the construction field, gained principally through his association as general sales manager with the shovel and crane division of the Lima Locomotive Works at Lima, Ohio, and as west coast district manager with the Koehring Co., at Milwaukee, Wis. Postwar plans are now being made to distribute Standard products nationally through established equipment distributors.

The $1,300,000 detinning plant built in Birmingham, Ala., for the Defense Plant Corporation will go into operation soon with Edward Daykin as manager, President Robert J. Davis, of the Southern Detinning Co. announces. Johnston & Jennings, of Cleveland, Ohio, will operate the plant, which will have an annual capacity of 20,000 tons of scrap. Tin cans and other tin articles collected in Alabama and four other southern states will be shipped there, the tin recovered and rolled into plates and sent to the Gadsden mills of the Republic Steel Corp. for conversion into commercial products.

McCulloch Engineering Corp., Milwaukee, Wis., has announced the appointment of Donald A. Sutherland as field engineer in charge of sales and sales promotion activities. McCulloch, a division of Borg-Warner, manufactures superchargers and blower equipment. Mr. Sutherland is a graduate of the engineering school of the University of Minnesota. Before joining McCulloch, he spent ten years with Fairbanks-Morse in St. Paul, Minn.,

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Editor-in-chief: L. C. Urquhart, Professor of Structural Engineering, Cornell University. 2nd edition. 877 pp., illus., $5.00.

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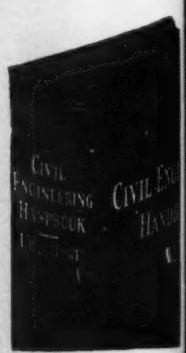

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The steel rollers grip as they roll; the greater the pressure the tighter the grip. Position at installation shown in black; under extreme pressure in gray.
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ith only three parts to position and two ts to tighten, Rolagrips afford the sim- st, fastest method of joining pipe for kproof connections. By using plain end pe, Rolagrips eliminate time-wasting reading, grooving or flanging oper- ons. Since none of the pipe walls ed to be cut away, Rolagrips per- mit the use of light weight pipe in many industrial installations. When Rolagrips are used, both couplings and pipe may be completely salvaged. Despite heavy demands, prompt shipments are being maintained on Rolagrips; also Segweld Fittings and Gruvagrip Couplings, the latter for grooved end pipe.

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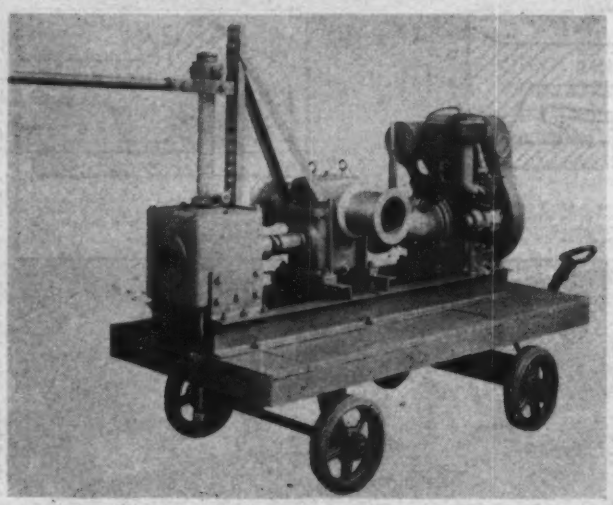

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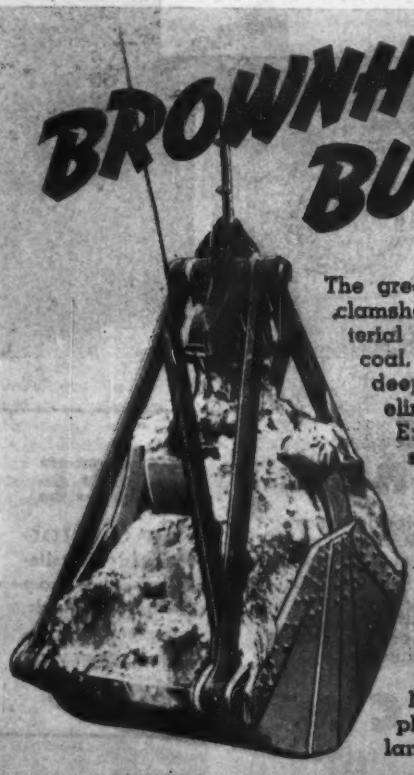

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in engineering work in the municipal and industrial markets for diesel engines.

F. C. Biggert, Jr., chairman of the board of the United Engineering and Foundry Co., Pittsburgh, Pa., has been elected a director and a member of the executive committee of the Follansbee Steel Corp., Follansbee, W. Va., to fill the vacancy caused by the death of George T. Ladd.

C. H. Lewis, has just completed his 25th year with the Irving Subway Grating Co., New York. As vice president and general manager of the plant in Long Island City, Mr. Lewis has worked with the steel industry through the most difficult period in its history.

"After what we've gone through in the past 25 years," Mr. Lewis said, "I can't believe that the postwar period will produce any problems that American ingenuity and American workers cannot solve. Tomorrow it will be steel highways, helicopter landing fields atop big city buildings, more and more steel decking as flooring for bridges—and countless other products."

The appointment of Theodore F. Collier as manager of the Celocrete Department of The Celotex Corporation of Chicago has been announced.

Since his graduation at the University of Illinois, Collier has been continuously engaged in the building industry in construction and structural design. He spent several years with the Portland Cement Association as district structural engineer in New York and as regional structural engineer in Chicago.

Paul Woodworth, former research engineer with the Portland Cement Association, has joined the Waylite Co., Chicago manufacturer of machine-expanded slag aggregates. Mr. Woodworth will direct the company's research and technical development.

His work in the field of concrete products began in 1917, when as testing machine operator for the Portland Cement Association, he gathered data on testing of concrete for publication in Bulletin 1, *Structural Materials Research Laboratory*. Following service in the Signal Corps with the A.E.F. during World War I, Woodworth returned to the University of Illinois, being graduated in 1920. Mr. Woodworth returned to the Portland Cement Association in 1925, first as associate research engineer and since 1929, as technical engineer.

Model ME-650 Murphy Diesel 200 Horsepower, 6-cylinder, supercharged engine, powering a Davenport-Besler locomotive.

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These modern Diesels fit your job . . . their compactness, relatively light weight, portability and dependable power can be relied upon, day-in and day-out. They start easily . . . premium-priced fuels are not needed . . . operating costs are low . . . No unnecessary shut-downs for maintenance . . . simple to operate, and require no specialist to keep them on the job. Their ruggedness gives them longer work-life . . . on either long, continuous operation or intermittent peak-loads, they are equally "willing and able". Write for bulletin.

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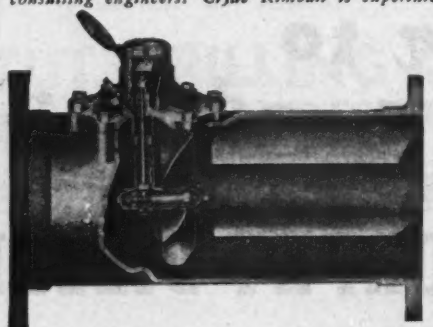

Types and Sizes for Main-Lines from 2-inch up.

Each Sparling Meter is a complete totalizing unit—the propeller revolving in the flow is geared directly to the Totalizer, as shown. Flanged, Bell & Spigot and Threaded tube-mounted meters; also Saddle-mounted for easy installation on lines in place. The meter in upper right illustration is saddle-mounted on a vertical pipe.

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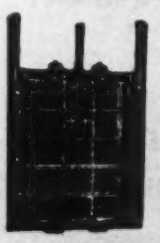

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the cement products bureau. He originated several important procedures for testing concrete and has made many contributions to concrete masonry research literature. In 1929, with H. F. Gonnerman, he received the Wason Medal for noteworthy research, awarded by the American Concrete Institute for a paper on "Tests of Retempered Concrete."

Link-Belt Co., Chicago, has announced the election of two vice presidents.

E. L. Berry, vice president and general manager of Link-Belt Ordnance Co., has been elected vice president of Link-Belt Co., the parent organization. He began his Link-Belt career in 1914, has for many years devoted his time to production and personnel. His new headquarters will be at the company's general office, 307 N. Michigan Ave., Chicago.

Richard F. Bergmann, company chief engineer, has been elected a vice president of Link-Belt Co.

He came to Link-Belt in 1924, through the purchase of Howe Chain Co., Muskegon, Mich.

John E. Martin has been appointed manager of Link-Belt Ordnance Co., with headquarters at the plant. Mr. Martin started his Link-Belt career in 1927, and since Pearl Harbor has been assistant to Brigadier General G. M. Wells, War Dept., Washington, D. C.

The Marion Steam Shovel Co., Marion, Ohio, has announced the appointment of Walter N. Westland as sales manager. Mr. Westland joined the Marion organization in 1925, upon completing his studies at Massachusetts Institute of Technology where he was graduated in civil and highway engineering. After a year of fundamental and practical sales training at the main office and in the plant, Mr. Westland was transferred to the New York sales office.

In 1927 he was transferred to the New England sales branch and became district manager in 1932, a position he has held until his present appointment as sales manager at the home office.

M. W. Rogers, widely known for activities in the development and production of diesel engines, died recently in Chicago, Ill. He had been associated for 20 years with the Caterpillar Tractor Co., Peoria, Ill., serving first as factory manager and later as general factory manager. After a short period of retirement, he was induced to contribute his knowledge of production methods to the war effort and became president of two Milwaukee concerns; the Universal Unit Machinery Corp. and the Davis & Thompson Co. Under his direction, Universal was converted from the manufac-

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Hundreds in world-wide use have proved the smoothness, economy and sturdiness of CP's 500-ft. Diesel-driven portable air compressor. Its exceptional smoothness is the result of the fine, inherent balance of the true V-8 arrangement of the compressor cylinders, and the use of a 6-cylinder engine. The compressor is of the two-stage, air-cooled type; the engine is the Caterpillar D-13000 Diesel.

Incorporated also are the well-known CP features: gradual speed regulation . . . Simplate Valves . . . pressure lubrication . . . self-adjusting clutch . . . spring suspension and automotive steering. CP Portable Compressors are available also in sizes of 60 to 315 c.f.m. gasoline or Diesel powered. Write for complete data.

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ROGERS TRAILERS have played a big part in fortifying our coasts by transporting defensive weapons and materials of war to fortifications around the nation.

They are with our fighting men overseas and thousands of them are doing a tremendous job on the industrial front. The ROGERS TRAILERS which will again be available to all when war contracts are completed, will be better-engineered, better-constructed and more efficient than the multitude which have been operated so successfully for many years!

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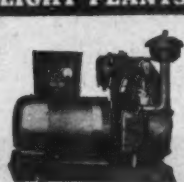

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ture of power shovels to anti-aircraft guns, while at the same time he greatly increased the production of intricate machine tools by the Davis & Thompson Co.

BUD H. RADER, 65, vice-pres., Lehigh Portland Cement Co., died recently in Chicago, Ill. Widely known as a leader in the cement industry for the past 30 years, Mr. Rader had been connected with the Lehigh Portland Cement Co. since 1912 when he began as western sales manager.

ROBERT C. TRUNDLE, director member of the staff of Trundle Engineering Co., Pittsburgh, Pa., has been elected vice-president of the company, George T. Trundle, Jr., president, reports. Mr. Trundle went to Washington, D. C., in November, 1940, where he served as production engineer in the Ordnance Department, returning to Pittsburgh in February.

EXPANSIBLE STEEL TRUSS CO. of 2708 S. 32nd St., Milwaukee, Wis., has changed its name to the Ray J. Mothes Company, Inc.

Election of George M. Carvlin as vice president of Koppers Co., Engineering and Construction division, is announced. Mr. Carvlin had been an assistant to Joseph Becker, vice president since 1940. He started with Koppers as a research engineer in 1925, later serving in the operating and sales departments.

His first position after being graduated from the University of Illinois in 1922, was with the Corn Products Refining Co., New York. After three years he left that firm to join Koppers.

REGINALD E. STURDY was promoted to the position of superintendent of the Fairfield Sheet Mill, Tennessee Coal, Iron & Railroad Company. He was graduated from Purdue University in 1914 and in 1919 began service with the American Sheet & Tin Plate Company. In 1936 he was appointed superintendent of Carnegie-Illinois Steel Company's New Castle Works, and went to Birmingham, Ala., in 1938 as assistant superintendent of the Fairfield Sheet Mill.

R. N. SIMPSON and A. F. Simpson, Jr., who for the past several years have been identified with the steel industry in California, recently purchased the long established firm of Davenport Mfg. Co. in Los Angeles, manufacturers of farm equipment and road machinery. The company is also one of Southern California's leading producers in manufacturing ship parts, including masts, king posts, doors, hatches, etc. The Daven-

ort Manufacturing Co. is planning a rge program for the production of ostwar fabricated steel products in adition to enlarged lines of the latest deign in agricultural and road building achinery. The new management anounces the appointment of Everett T. mall as manager of the Farm Implent and Road Machinery Divisions. Mr. Small brings over 15 years of machinery experience in sales, research, esign and development engineering ith the J. D. Adams Manufacturing o., of Indianapolis, Ind.

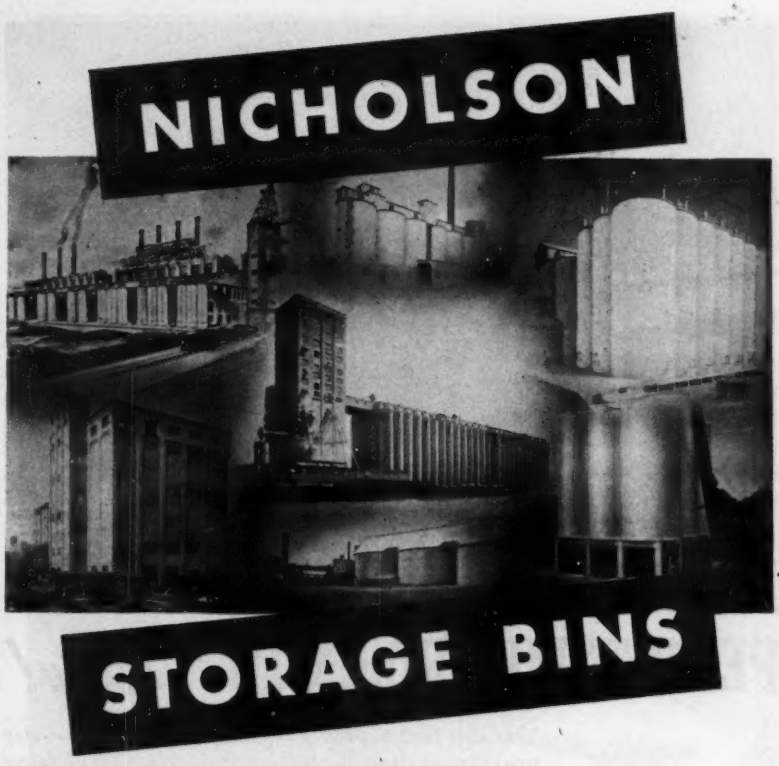
BRIEF NEWS

Need for more housing facilities in ugene, Ore., was demonstrated in a reent survey conducted by the Office of ivilian Defense and submitted to the ortland office of the National Housing gency. Conducted by the block leader rganization of Lane County, the survey evealed a 99.4 percent occupancy—34 acant houses and apartments out of ,645 surveyed. Howard Merriam, ounty defense coordinator, said the urvey covered 80 percent of the dwellngs listed in the 1940 Eugene census nd therefore was considered comlete and accurate.

The survey was requested by Fredrick Cuthbert, senior representative of he NHA at Portland.

Because the shortage of materials, en and equipment has brought new ighway construction and major imrovements almost to a standstill, there re now no detours on the North Caroina state highway system—for the first me since the State Highway and Pubic Works Commission was formed over 2 years ago. In calling attention to his fact, James S. Burch, of Raleigh, tatistics and planning engineer for he commission, says that the only conruction work now in progress involves ccess roads to military bases and that the entire limited forces of the comission are concentrating upon the normous task of maintenance, to hold he roads in the best possible condiion; and in preparation of detailed oad project construction plans for he postwar period."

The War Department has now definitely informed Westchester County, Y., that it does not intend to occupy t present the Westchester County Airort near Rye Lake, but that the field ust be kept available for military use ntil the end of the war. The letter naking a war orphan of the $4,000,000 roject, which has been under negotiaion and construction for two years and



Get Blue Prints Ready, Anyway

THESE are puzzling days! To paraphrase our good friend Hamlet: "To construct or not to construct? That is the question." But there is no question as to the advisability of planning. This can and should be done just as quickly as objectives can be determined.

Right now we're rendering a "planning" service to several companies who want to get all engineering details of storage bins or tanks prepared so that when the green light clears the way for construction, no time will be lost.

In considering our service along these lines, bear in mind that Storage Bins and Tanks, together with all materials-handling facilities, have been our specialty since 1914.

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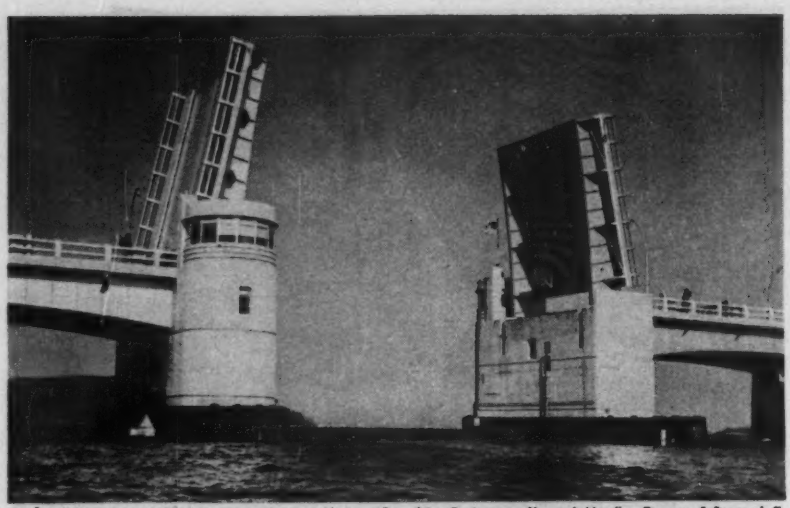

Oceanic Bridge over Navesink River near Rumson, N. J. • Consulting Engineers—Howard, Needles, Tammen & Bergendoff.

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You can find a practical answer to your post-war bridge operating machinery problems by specifying Earle equipment. For over 40 years, Earle operating machinery has proven its ability to give years of uninterrupted service with a minimum of maintenance on swing, vertical and rolling lift, bascule and ferry transfer bridges—as well as in sewage disposal plants, locks, dams, gates, dredges, etc.

Save future time by letting an Earle engineer help you now in planning peacetime projects. Write for Booklet 42-B.

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is not yet wholly completed, was written by Lieut. Col. John M. Lyle, of the construction branch of the Army Air Forces, to County Executive Herbert C. Gerlach.

To provide white collar employees of the Tennessee Valley Authority with a medium for joint discussion of pay matters, an employee salary policy panel was set up recently by cooperative action of employees and TVA management. Officials believe this is a significant step in the development of collective bargaining machinery outside the customary trades and labor fields.

The three organizations composing the panel are the TVA council of office, technical and service employees' unions; the TVA association of professional chemists and chemical engineers, and the TVA engineers association. The TVA Council, in turn, is composed of five unions—public safety service employees, office employees, chemical workers, hotel and restaurant employees and building service employees.

The Halifax, N. S., council of social agencies is advocating large scale public housing, including many apartments to be rented at from $10 to $17 per month, and the dominion government is asked to take the initiative in the movement, particularly in respect to financing. The council contends that public housing involving slum clearance is the joint responsibility of the dominion, provincial and municipal government and that nothing should be done without careful planning.

An old blast furnace at Cumberland Furnace, Dickson County, Tenn., dating back to 1792, is being wrecked and its iron will be used for war production. The property was recently bought by a Chattanooga iron dealer.

A Dallas, Tex., contractor had sixty priorities for the building of defense housing canceled because he offered in an advertisement to sell the priorities to contractors desiring them.

A $1 million government building for Vancouver, B. C., and a $5 million building program for British Columbia in general, has been announced by Premier John Hart. The government also plans extensions and alterations in the parliament buildings and department offices in Victoria. Many other cities will come under the scope of the postwar building program of the province.

The Mississippi River Commission has under consideration the appeal of more than 150 representatives of various organizations for a 12-foot navigable

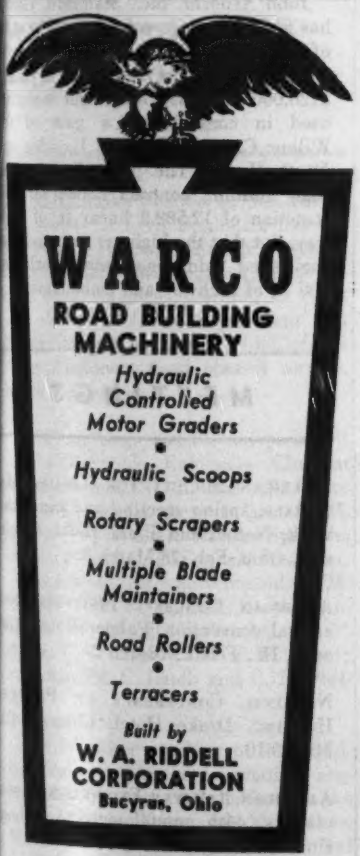
channel from Caixo, Ill., to Baton Rouge, La. One of the backers of the plan is O. Slack Barrett, president of the Ohio River Valley Improvement Association, who asked that the commission "develop and report to Congress a thorough-going plan for fitting the river for its job."

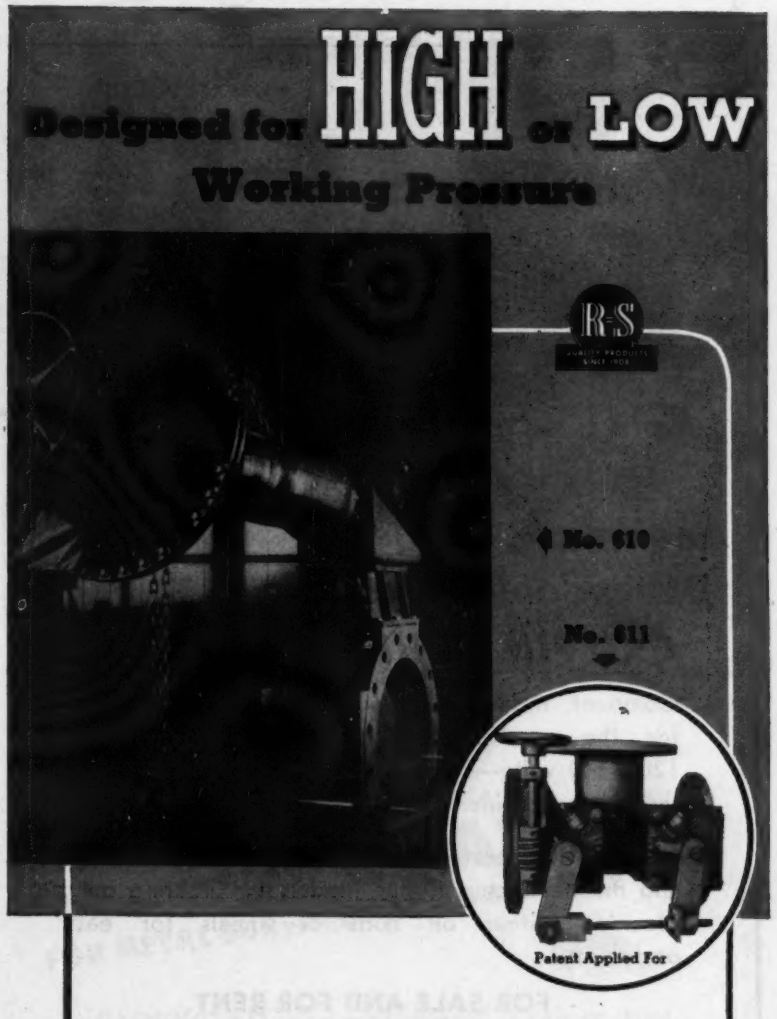
Two postwar projects are assured for the public works program of Toronto, Ont. Elwood Hughes, general manager of the Canadian National Exhibition, has announced that at the end of the war all the exhibition buildings will be turned back by the federal government and will need to be entirely reconstructed inside after use of the buildings for army, naval and airforce training. This work will cost at least $1 million.

Legislation will be sought soon authorizing the construction of a long-planned new central wholesale terminal produce market in Toronto. This also will cost about $1 million.

Iowa's famous "High Bridge," between Granger and Madrid, Ia., is being razed by the Fort Dodge Iron & Metal Co. The structure is 2,065 feet long and at its highest point 107 feet above the Des Moines River bed.

There are an estimated 22 carloads of iron and steel in the structure, the





These two illustrations of R-S Butterfly Valves exemplify the wide pressure range (15 to 900 psi) handled by this type valve as well as the simplicity of design.

When completely assembled, the heavy duty power operated valve, No. 610, will be equipped with a dual stuffing box, hand wheel declutching unit, hand jack and mercury switch. Shaft supported on ball or sleeve bearings enclosed in grease packed journals—pressure lubrication.

The manually operated three-way valve, No. 611, is utilized for quick interchange and mixing service. It is adapted to power operation as well as high pressures and elevated temperatures.

This visual presentation of R-S Engineering speaks for itself. If you are interested in simplified control and shut-off of volume and pressure, write for the complete story contained in the new R-S Catalog No. 14-B.

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first sections of which were built in 1882. It carried a railroad line, now abandoned for a new route.

A proposal by the Allegheny County, Pa., airport advisory committee to enlarge Pittsburgh's new Moon Township airport suggests buying more farm land adjacent to the 1,100-ac. site, extending the three 1-mile-long runways from 1,000 to 2,000 ft., widening present 150-ft. runways by 50 ft. and building and servicing a fourth runway. The committee includes County Planning Engineer Park H. Martin and County Works Director J. B. Sweeney. Federal aid will be asked.

Construction of the controversial 1200-Tennessee Gas & Transmission Co. pipe line from Nueces County, Tex., to West Virginia is going forward at central points, river crossings and compressor stations, according to Gardner Symonds, president of the company. Welding will soon begin as the river crossing pipe has already been received, and the main line pipe is arriving rapidly.

The Texas Senate's investigating committee held a hearing at Austin, Jan. 3 and 4, for proponents and opponents of the pipe line. No witness appeared to oppose construction of the line.

John Arborio, Inc., Stamford, Conn., has filed a damage suit against the state of Connecticut and Highway Commissioner William J. Cox seeking to collect $120,000 for extra labor and materials used in constructing a part of the Wilbur Cross Parkway in Hamden and North Haven. The plaintiff claims his road building contract called for construction of 12,582.2 linear ft. of highway, but that the highway commissioner compelled additional work including 200 ft. of highway and embankment.

MEETINGS

AMERICAN SOCIETY FOR TESTING MATERIALS, spring meeting and committee week, Netherland Plaza Hotel, Cincinnati, Ohio, Feb. 28-March 3.

AMERICAN CONCRETE INSTITUTE, 40th annual convention, Palmer House, Chicago, Ill., Feb. 29-March 2.

NATIONAL CONFERENCE ON POSTWAR HOUSING, Drake Hotel, Chicago, Ill., Mar. 8-10.

AMERICAN RAILWAY ENGINEERING ASSOCIATION, 44th annual meeting, Palmer House, Chicago, March 14-16.

American Wood Preservers Association, annual meeting, Palmer House, Chicago, Ill., April 26.

Regional and Local Meetings

New York State Society of Professional Engineers, midwinter meeting, Ten Eyck Hotel, Albany, N. Y., Feb. 25-26.

Michigan Highway Engineering Conference, 30th annual meeting, Grand Rapids, Mich., Feb. 8-March 1.

School of City Street Superintendents and Public Works Officials, Institute of Government, Chapel Hill, N. C., Feb. 29-Mar. 1.

Arkansas Engineering Society, annual meeting, Marion Hotel, Little Rock, Ark., Feb. 25-26. Minnesota Section, A.W.W.A., St. Paul, Minn., March 13-17.

The New Jersey Mosquito Extermination Association, the Hotel Madison, Atlantic City, New Jersey, Mar. 15, 16 and 17.

New Jersey Sewage Works Association, 29th annual meeting, Stacy-Trent Hotel, Trenton, N. J., Mar. 23-24.

Elections and Activities

The Nebraska Section of the American Society of Civil Engineers has announced the election of Edwin W. Woodbridge, Omaha city engineer, as president. State Engineer Wardner G. Scott was elected senior vice president and Edgar E. Foster, Omaha, chief of the Army Engineers flood control section, junior vice president.

H. E. Hastings was elected president of the Reynolds Engineers Club at Winston-Salem, N. C., Jan. 15. Other officers named for the year are: L. M. Hines, vice president; Charles Sprinkle, secretary; and C. F. Greene, treasurer. Committees are: entertainment, H. M. Phillips, F. P. Flynt, C. E. Stephenson, and V. H. Clough; executive, R. P. Reece, C. E. Spann and F. P. Flynt; custodian, W. C. Lamb and C. P. Phillips.

The following members of the Building Trades Employers Association, representing the various branches of the construction industry in Milwaukee, Wisc., were elected at their annual

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meeting: President, A. A. Ornst; vice president, N. J. Klein; secretary, R. Biersach; treasurer, G. Toepfer.

Thornton J. Corwin has been elected president and T. P. Dresser second vice president, of the San Francisco Section, American Society of Civil Engineers. Officers carried over are George W. Whittle, who becomes first vice president, and E. M. Knapik, secretary-treasurer.

Officers of the Engineering Association of Nashville, Tenn., have been installed as follows: Wilbur C. Sensing, president; Harry B. Dyer, vice president; Lawton T. Sumner, secretary-treasurer. Directors, Charles W. Hawkins, Oscae E. Martin (retiring president); John Oman, Jr., Walter F. Pond and Francis B. Waterfield.

E. S. McKittrick, specialist in industrial plant construction and head of a contracting firm bearing his name, was installed as president of the Southern California Chapter, Associated General Contractors of America, recently. The outgoing president was Lyman D. Wilbur.

At the recent annual meeting of the Colorado Society of Engineers, Arthur F. Hewitt, assistant Colorado state highway engineer, was elected president; S. O. Harper, chief engineer, U. S. Bureau of Reclamation, vice president; and C. M. Lightburn, valuation engineer, Denver & Rio Grande Western Railroad Co., was re-elected secretary and treasurer.

Officers of the Tennessee Valley section of the American Society of Civil Engineers for 1944 have been elected as follows: President, Harry Wiersema; vice president, Asheville, J. E. S. Thorpe; vice president, Chattanooga, T. D. Lebby; vice president, Knoxville, A. T. Granger; vice president, Muscle Shoals, F. H. Derby.

P. V. Pennybacker, designing engineer, Bridge Division, Texas State Highway Department, was elected president of the Travis Chapter, National Society of Professional Engineers. He succeeds John A. Norris. Other officers elected include Seth D. Breeding, first vice president; G. S. Moore, second vice president; P. A. Keller, secretary-treasurer, and D. C. Kinney, H. W. Zuch, and D. D. Williamson, directors.

Officers of the Springfield chapter of the Illinois Association of Highway Engineers have been elected as follows: President, J. R. Shelburne; vice president, W. J. Bolling; secretary, F. J. Cremer; treasurer, Harry J. Alton;

ergeant-at-arms, C. N. Bullard; director to state board, Earl M. Guy; trustees, D. D. Starke, E. M. Crump and L. E. Leka.

Pittsburgh Builders Exchange has elected officers and directors for 1944. President, Calvin A. Landau, Landau Bros. Building Co.; first vice president, William K. Allen, Harrison Construction Co.; second vice president, Hays M. Junkin, Knox, Strauss & Bragdon Co.; third vice president, D. Navarro, Navarro Construction Co.; fourth vice president, Harry S. Davison, J. K. Davison & Bro.; treasurer, Eli Abbott, Abbott Construction Co.; counsel, A. W. Forsyth; secretary, Robert K. Cochrane, Jr., executive secretary, Pittsburgh Builders Exchange. Of the above officers, Landau, Allen, Junkin, Navarro, Davison also were elected directors.

Lysle W. Weeks has been elected president of the Builders' Association of Kansas City, to succeed Albert R. Waters. Other officers elected were: Forrest F. Dodds, first vice president; W. T. Conroy, second vice president, and Emil J. Rohrer, treasurer.

Named for 2-year terms were five directors: Harman R. Brown, George H. Geiske and Frank H. Spink, with Orville Campbell and Lysle W. Weeks re-elected. Holdover members are W. T. Conroy, Forrest F. Dodds, J. E. Dunn,

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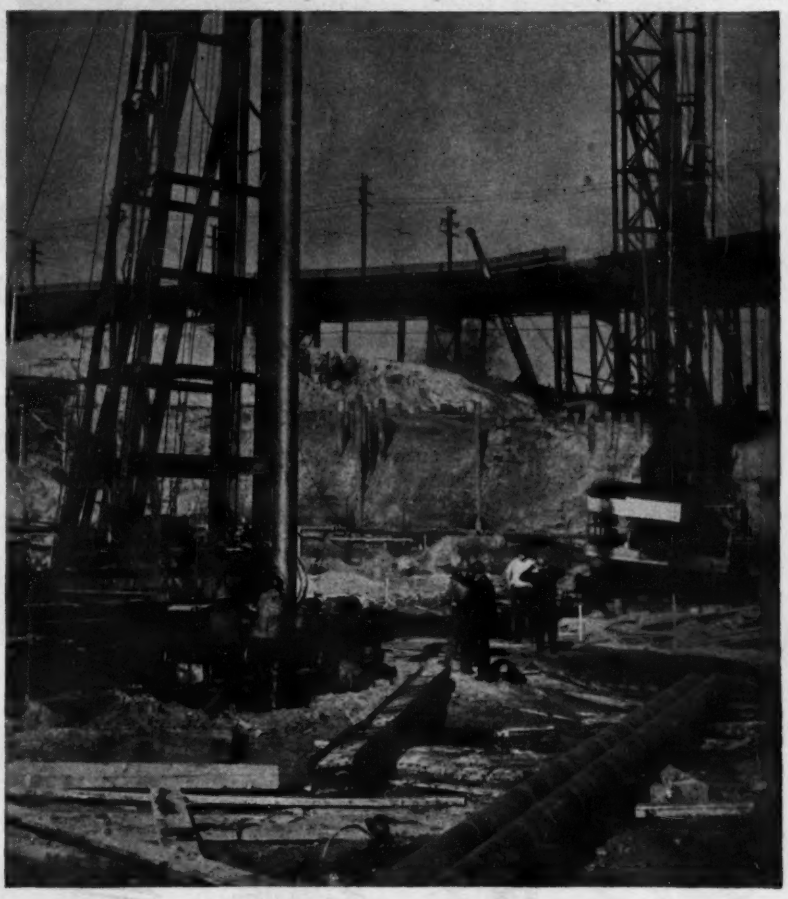

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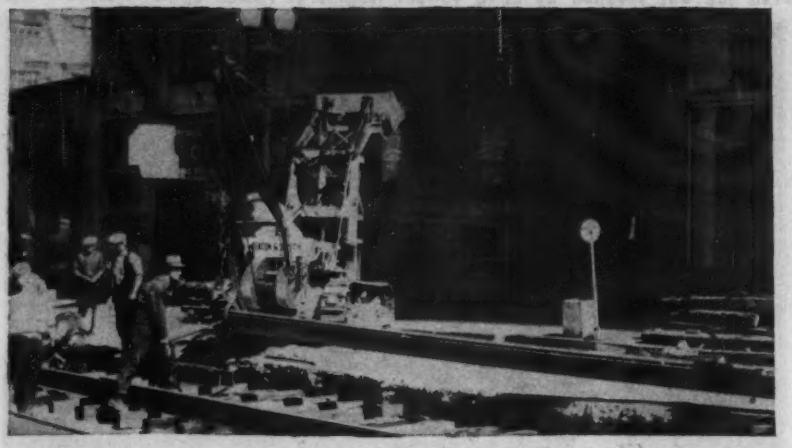

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Paul A. Jordan and Emil J. Rohrer. These ten men will constitute the board of directors for the coming year. Harry G. Palmer was appointed secretary-manager for the twelfth consecutive year.

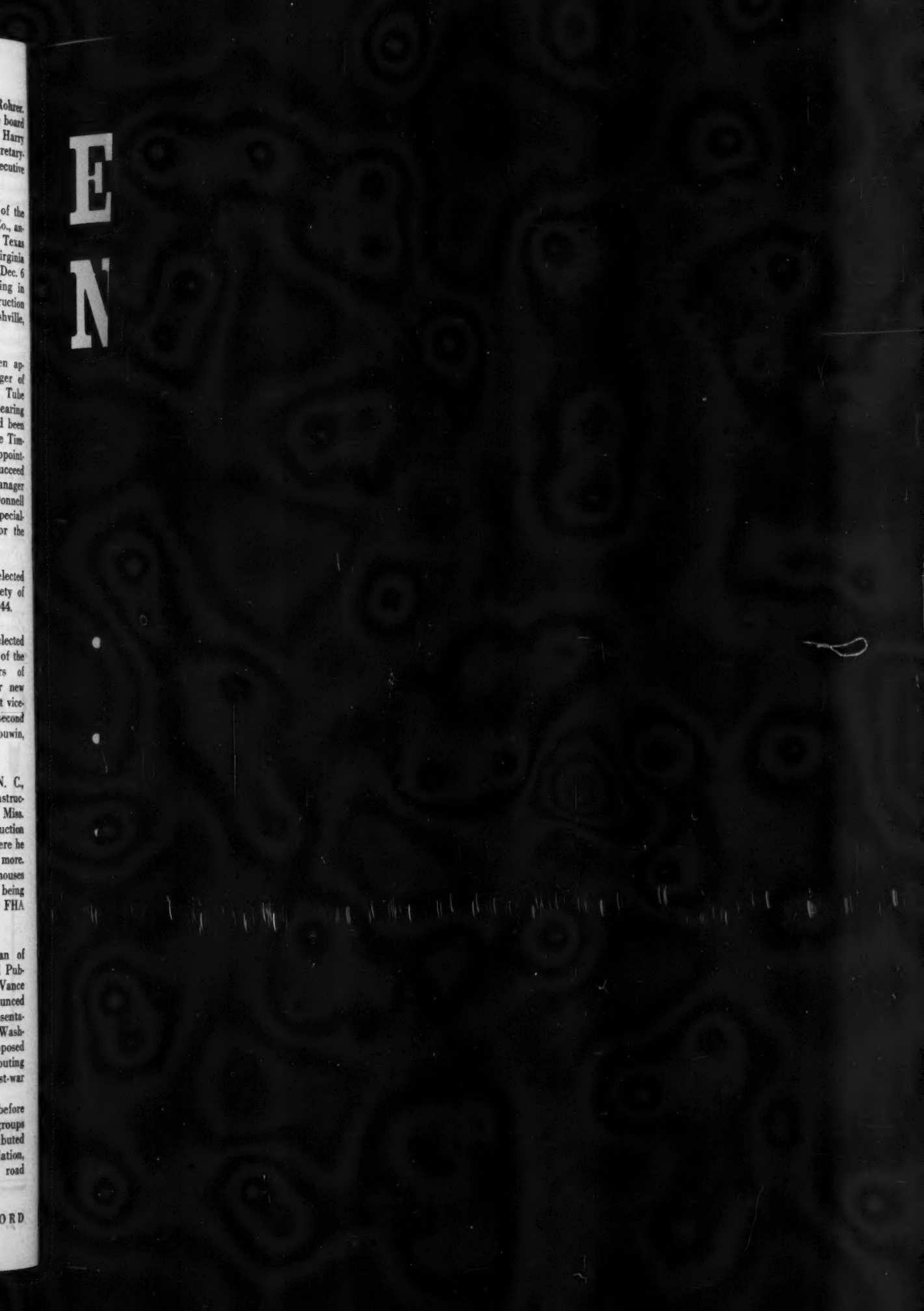
Gardiner Symonds, president of the Tennessee Gas & Transmission Co., announced that construction of the Texas leg of the Corpus Christi-West Virginia natural gas pipeline was started Dec. 6 at the Guadaloupe River crossing in Victoria County. The first construction of the line was opened at Nashville, Tenn., the week before.

DONALD S. KLIPPERT has been appointed assistant general manager of sales of the Timken Steel and Tube Division of The Timken Roller Bearing Co., Canton, Ohio. Klippert had been Cleveland district manager of the Timken Steel and Tube Division. Appointment of Robert P. Donnell to succeed Klippert as Cleveland district manager was made at the same time. Donnell has been a Timken engineer specializing in aircraft applications for the past six years.

Edwin W. Seeger has been elected president of the Engineers Society of Milwaukee, Wis., for the year 1944.

F. M. Frandsen has been elected president of the Nevada Chapter of the Associated General Contractors of America, Inc., for 1944. Other new officers are E. J. Maupin, Jr., first vice-president, A. D. Drumm, Jr., second vice-president, and Walker J. Bouwin, treasurer.

Marshall Moore, Charlotte, N. C., contractor, is supervising the construction of 101 new houses at Biloxi, Miss. He has just completed the construction of 45 houses at Laurel, Miss., where he plans to begin work soon on 35 more. He also recently completed 45 houses at Laurinburg, N. C. All are being built in war industry areas under FHA regulations.

Charles Ross, acting chairman of the North Carolina Highway and Public Works Commission, and Vance Baise, chief engineer, have announced their intention of joining representatives of other Southern states in Washington soon to protest a proposed change in the manner of distributing federal highway funds for post-war construction.

They will protest proposals before Congress by some New England groups that the funds should be distributed principally on the basis of population, instead of area, population and road mileage.